'68' MICRO JOURNAL

2.00

VOLUME I ISSUE 4 • Devoted to the 6800 User • June 1979

"Small Computers Doing Big Things."

SERVING THE 6800 USERS WORLDWIDE

PHOTO CREDIT: NASA

SYSTEMS – SOLUTIONS

If you have a problem that can be solved by a computer—we have a systems solution.

- Two central processors with maximum RAM capacities of 56K and 384 K bytes
- Three types of disk drives with capacities of 175K, 1.2M and 16M bytes
- Two dot matrix printers with 80 and 132 line capacity
- A Selectric typewriter interface and a daisy wheel printer

Match these to your exact need, add one or more of our intelligent terminals and put together a system from one source with guaranteed compatibility in both software and hardware.

Southwest Technical Products systems give you unmatched power, speed and versatility. They are packaged in custom designed woodgrain finished cabinets. Factory service and support on the entire system and local service is available in many cities.

SOUTHWEST TECHNICAL PRODUCTS CORPORATION
219 W. RHAPSODY
SAN ANTONIO, TEXAS 78216 (512) 344-0241

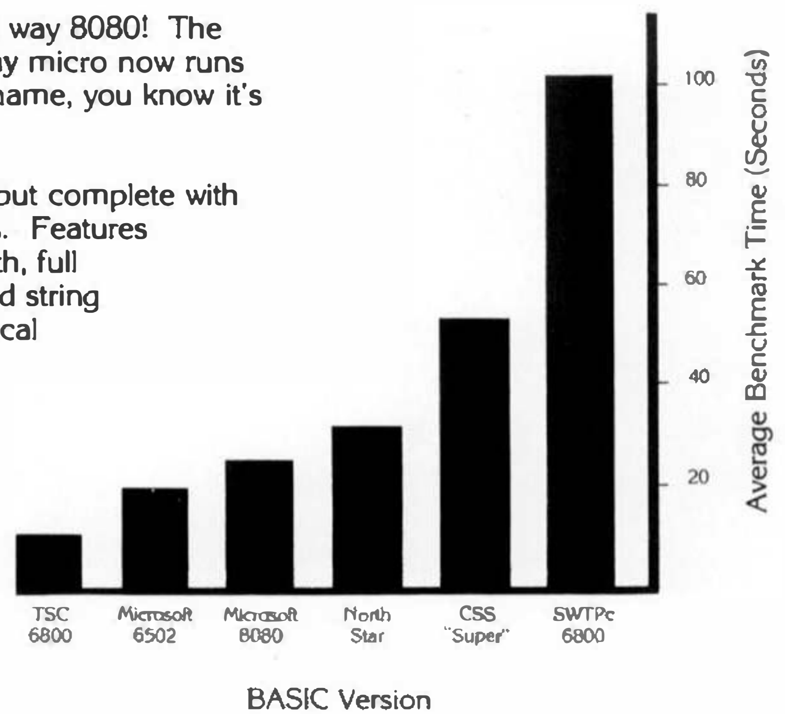
TSC BASIC for 6800

The fastest floating point BASIC for any micro.

Move over 6502! Out of the way 8080! The fastest floating point BASIC for any micro now runs on the 6800. And with the TSC name, you know it's top quality.

TSC BASIC is not only fast, but complete with over 50 commands and functions. Features include six digit floating point math, full transcendental functions, unlimited string length, if/then/else construct, logical operators,and two-dimensional arrays (including string arrays).

Available now on KCS cassette for $39.95. Requires 9K minimum, no source listing included. Soon to come is a version for the FLEX™ disk operating system.



Graph based on benchmarks listed in October 1977 issue of Kilobaud™ magazine.

Technical Systems Consultants, Inc.
Box 2574 W. Lafayette, IN 47906

Specialists in Software & Hardware for Industry & the Hobbyist

'68' MICRO JOURNAL

Portions of the text of '68' Micro Journal set using the following:
6800/2, DMAF1 and CT-82
Southwest Technical Products Corp.
219 W. Rhapsody
San Antonio, TX 78216

Editor, Word Processor and Sort/Merge
Technical Systems Consultants, Inc.
Box 2574
W. LaFayette, IN 47906
*MINIFLEX & FLEX REG.™ Technical Systems Consultants, Inc.

Selectric I/O
World Wide Electronics, Inc.
130 Northwestern Blvd.
Nashua, NH 03060

Publisher/Editor
Don Williams Sr.

Assistant Editor — Software
Mickey E. Ferguson

Assistant Editor — Hardware
Dennis Womack

Associate Editor — Southwest
Dr. Jack Bryant

Associate Editor — At Large
Dr. Chuck Adams

Associate Editor — Midwest
Howard Berenbon

Subscriptions and Office Manager
Joyce Williams

Typography and Color Separations
Williams Company, Inc.
Chattanooga, TN 37421

CONTENTS

Send All Correspondence To:

'68' Micro Journal
3018 Hamill Rd.
PO Box 849
Hixson, Tennessee 37343
— Phone —
Office: 615-870-1993
Plant: 615-892-7544

'68' Micro Journal is published 12 times a year by '68' Micro Journal, 6131 Airways Blvd., Chattanooga, TN 37421. Second Class postage paid at Chattanooga, TN. Postmaster: Send Form 3579 to '68' Micro Journal, PO Box 849, Hixson, TN 37343.

Increasing September, '79 40%

Subscription Rates U.S.A.:
(Special Charter Rate)
1 year $10.50
2 years $18.50
3 years $26.50
Lifetime $125.00 (one-time payment) Twice rate shown above for Air Mail/First Class anywhere in the U.S.A.

—ITEMS SUBMITTED FOR PUBLICATION—

(Letters to the Editor for Publication) All 'letters to the Editor' should be substantiated by facts. Opinions should be indicated as such. All letters must be signed. We are interested in receiving letters that will benefit or alert our readers. Praise as well as gripes is always good subject matter. Your name may be withheld upon request. If you have had a good experience with a 6800 vendor please put it in a letter. If the experience was bad put that in a letter also. Remember, if you tell us who they are then it is only fair that your name 'not' be withheld. This means that all letters published, of a critical nature, cannot have a name withheld. We will attempt to publish 'verbatim' letters that are composed using 'good taste.' We reserve the right to define (for '68' Micro) what constitutes 'good taste.'

(Articles and items submitted for publication) Please, always include your full name, address, and telephone number. Date and number all sheets. TYPE them if you can, poorly handwritten copy is sometimes the difference between go, no-go. All items should be on 8X11 inch, white paper. Most all art work will be reproduced photographically, this includes all listings, diagrams and other non-text material. All typewritten copy should be done with a NEW RIBBON. All hand drawn art should be black on white paper. Please no hand written code items over 50 bytes. Neatly typed copy will be directly reproduced. Column width should be 3¼ inches.

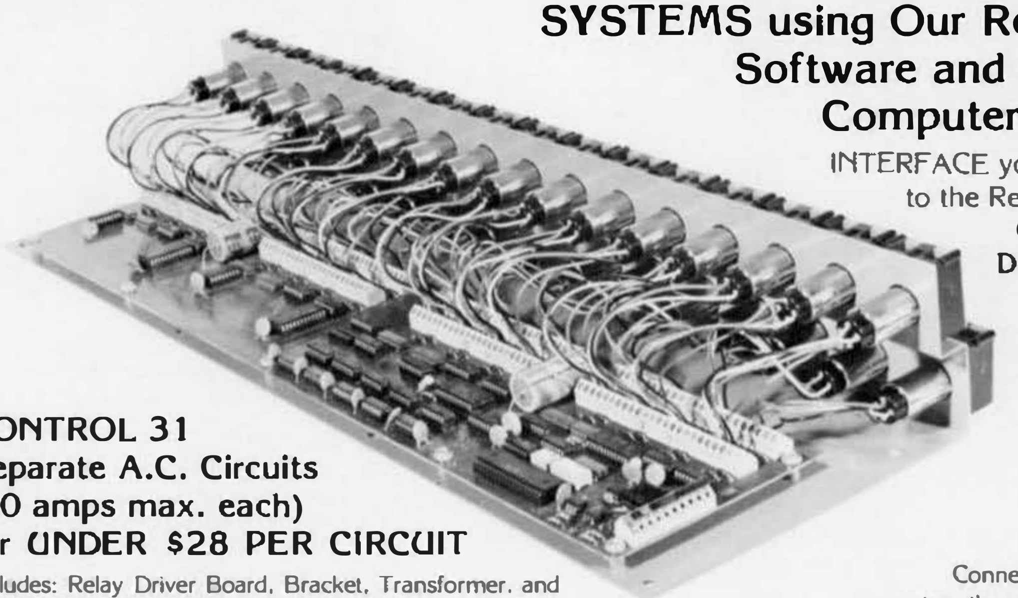
(Advertising) Any Classified: Maximum 20 words. All single letters and/or numbers will be considered one (1) word. No Commercial or Business Type Classified advertising. Classified ads will be published in our standard format. Classified ads $7.50 one time run, paid in advance.

Commercial and/or Business advertisers please write or phone for current rate sheet and publication lag time.

GHOST POWER

BOARDS for ALL COMPUTERS, or COMPLETE TURNKEY SYSTEMS using Our Real Time Software and GHOST Computer System

INTERFACE your Computer to the Real World with **GIMIX Relay Driver Boards.**



CONTROL 31 Separate A.C. Circuits (20 amps max. each) for UNDER $28 PER CIRCUIT

Includes: Relay Driver Board, Bracket, Transformer, and 31 GE RR-8 Relays. Assembled and Tested with Documentation and Software Driver Routines. **$848.05**

Relay Driver Boards Only **$448.86**

Connects to any Computer through a 20 ma. current loop (up to 4 Boards 128 Relays per port.) Reports the on/off status of each relay on demand.

INTERFACE the Real World to your Computer with GIMIX OPTO-BOARDS and REMOTE KEYPAD SYSTEMS:

OPTO-BOARDS Connect One 8 Bit Parallel I/O Port to as many as 34 Outside World Switch Closures (e.g. doorbells, eyes) with: 1500 Volt Isolation, built-in contact debounce, on board scanning and buffer.

REMOTE KEYPAD SYSTEMS

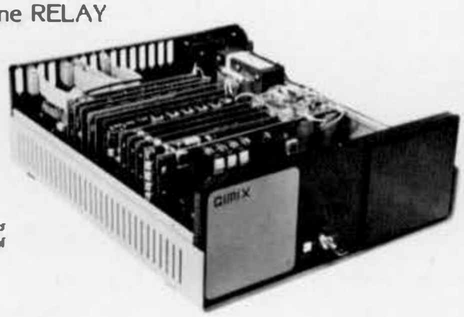
Provide Remote Data Entry for Computer Systems or Directly Control One RELAY DRIVER BOARD or STEREO SYSTEM CONTROLLER.

6800-SS 50 BUS 16K SYSTEMS

from **$1294.29**

Includes: Mainframe cabinet, mother board, power supply, fan, CPU, 16K static RAM, and choice of I/O card.

Other packages available



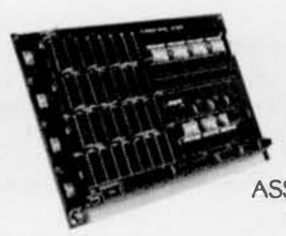
16K Static RAM Boards for the SS-50 Bus

MORE FEATURES:

- Gold bus connectors
- 4 separate 4K Blocks
- Individual Addressing Write Protect, and Enable/Disable for each Block
- Tested at 2MHz

AT A LOWER PRICE

ASSEMBLED **$298.13**



As above with Sockets and Software control features.

ASSEMBLED **$368.16**

THAT'S VALUE!

We would like to call your attention to the June 1979 issue of **Interface Age Magazine.** It will contain an article about **GIMIX** and go into more detail about our **GHOST Power Control System** than we can in this ad.

GIMIX INC.

The Company that delivers. Quality Electronic products since 1975.

1337 WEST 37th PLACE • CHICAGO, ILLINOIS 60609

(312) 927-5510 • TWX 910-221-4055

See GHOST Ad page 43

CRUNCHERS CORNER

Conducted by
Jack Bryant

Questions and comments submitted to this column can be on any subject relevent to "number crunching," and should be addressed to:

Jack Bryant
Department of Mathematics
Texas A&M University
College Station, Texas 77843

We ask that all correspondents supply their names and addresses.

MORE INTEGER ARITHMETIC

In earlier columns, we introduced 16 bit two's complement integer arithmetic. A "package" of fundamental subroutines, including division with remainder and I/O conversions, was coded in M6800 assembly language. Also included was a very simple program to illustrate and test the subroutines. In this month's column, we have three closely related goals: to clean up a loose end in the test program, to point out that last month's program evaluates expressions in a very nonstandard fashion, and to show how last month's package can be developed into an indexed integer arithmetic package. Let's start with the last.

We begin by pointing out the main disadvantage to accumulator arithmetic. Suppose we want to use subroutine ADDI to add two numbers, say in page zero memory locations with assembly language names OPR1 and OPR2, and we wish the result to end up in OPR1. Since this is the main program, we can assume that the index register is available, and we code:

```
LDX  OPR1
STX  I
LOX  OPR
STX  M
JSR  A  I
LOX  I
STX  OPR1
```

This segment requires 15 bytes. We could better have written

```
LDA  A  OPR1+1
ADD  A  OPR2+1
STA  A  OPR1+1
LOA  A  OPR1
ADC  A  OPR2
STA  A  OPR1
```

which requires only 12 bytes and is even faster than ADDI. The problem in using ADDI is moving the parameters (the contents of OPR1 and OPR2) to the software accumulators and back. The simplest but not always the best way out of this problem is to have no software accumulators and to maintain a *stack* of operands. (Another method is to make the arithmetic functions honest subroutines with parameters being passed using the stack pointer and indexed addressing. Much more on this later.) For the present, let's consider only the use of the index register to maintain the operand stack.

```
ABSOLUTE
ADDRESS                  DATA

  n     INDEX → MS BYTE \
 n+1            LS BYTE /  OPR1
 n+2            MS BYTE \
 n+3            LS BYTE /  OPR2
```

In this situation, the following subroutine ADDIX will replace (OPR1) with (OPR2)+(OPR1), *and it can be called efficiently.*

```
ADDIX  LDA  A  1,X
       ADD  A  3,X
       STA  A  1,X
       LDA  A  0,X
       ADC  A  2,X
       STA  A  0,X
       RTS
```

The user does not have to be concerned with the absolute address of the operands, nor with tedious in-line coding. However, a new orientation must be taken: namely, the operands are now managed using the index register, and binary operands now refer to the most recent two operands. To realize this, another keyword is required which operates somewhat like [ENTER↑] does on some hand held calculators (most notably, those of Hewlett-Packard).

Before going on, we should note that ADDIX takes roughly twice as long as ADDI; however, for more complex operations the difference between indexed and absolute addressing is relatively much less, and indexed addressing often requires less memory. As a general rule, expect to give away about twenty percent in time and save ten percent in memory when using indexed addressing.

AN INDEXED OPERAND STACK

The M6800 has a *real* stack, used for subroutine linkage and for the management of interrupts. What we mean by an *indexed stack* is an area of RAM which is managed like a real stack, but using the index register. Two variables are needed to manage the stack for our purposes:

TOPSTK The top of the stack

CURSTK The present pointer to the last two operands in the stack.

The size of the stack is limited only by how much memory is devoted to it. Operands enter the stack from the bottom, and are eliminated following an arithmetic operation. Binary operations eliminate the lowest operand on the stack and increment CURSTK to point to the present lowest. Unary operations replace the lowest by the result of the operation. (This is quite different from the algebraic approach taken before.) Before either type of operation, the eliminated operand should be saved so that some command can be used to retrieve it.

What seems to be evolving here is similar to the evaluation of an expression written in *Polish* notation (so called because it was developed by the Polish logician J. Lukasiewicz). In ordinary Polish notation, the operators preceed the operands. This is unnatural for hand entry of an expression. In reverse Polish, the operands preceed the operators. In a Hewlett-Packard calculator, instead of entering an algebraic expression such as 1+2=, one enters 1 [ENTER ↑] 2 + . The [ENTER ↑] key is used as a delimiter between operands 1 and 2. What makes this method so effective is the stack is now prepared for another operand and for another operator.

Any expression in algebraic notation can be translated into reverse Polish and contariwise. The interested reader may wish to try a few: in these examples, we let the operands be denoted by single

alphabetic characters (A,B,C,...) and consider only the four basic binary operators. (Others will be added later.)

Examples:

	Algebraic	Reverse Polish
1.	A*(B+C)	ABC+*
2.	(A+B)*C+D	AB+C*D+
3.	A+Y*(B+Y*(C+Y*(D+Y*E)))	AYBYCYDYE*+*+*+*+

Exercises:

4. A+B*C
5. A/B-C*D
6. A+(B+C*D/(E-F))

Example 3 is the evaluation of a fourth degree polynomial after it has been nested (i.e., using Horner's method). Note how much simpler the Polish expression is.

A Polish expression is much more easily evaluated than an ordinary one. The list of operands and operators is scanned left-to right; when an operator (binary or otherwise) is encountered, the arguments for the operator are the immediately preceeding operand stack elements. A binary operator requires two. The operator is evaluated, and all operands replaced by the evaluation. (This reduces by 1 the total number of operands for a binary operator.)

Before we consider how this can be coded, let's look at something strange about last month's approach. It is also related to the evaluation of expressions.

Suppose, in last month's program, one entered the string:

12345/5-1000N*2A [RETURN] .

Essentially instantly, 2938 is printed or displayed. It is instructive to examine the contents of I and M as this evaluation progresses:

I	M	OPR
12345	5	/
2469	1000	-
1469		N
-1469	2	*
-2938		A
2938 ← displayed		

Although the intent of last month's program was to allow notation in the test which was somewhat like ordinary algebraic notation, we neither allowed parenthesis nor recognized the different heirarchy which the various operations enjoy in usual notation. We will seriously address this problem in later columns.

IMPLEMENTING AN OPERAND STACK

The rules for managing the operand stack are implied by the rules for the evaluation of Polish expressions. In this implementation, we begin with (CURSTK) = (TOPSTK), with a certain number (say 10) bytes being reserved for the stack work area below actual operands.

The stack starts at (TOPSTK) and is increased in size when operands are placed in it. For example, suppose we reserve 20 bytes for the stack (allowing 5 operands to be stacked before any binary operators are applied).

Suppose the stack begins at location $200. Then the actual configuration of the stack initially and after the entry of numbers 8, -1, 10 and 256 is as follows:

Location (hex)	Initial	Stack 8	Stack -1	Stack 10	Stack 256
200	T,C→00	T,C→00	T → 00	T → 00	T → 00
201	00	00	00	00	00
202	00	00	C → 00	00	00
203	00	08	08	08	08
204	Work	Work	FF	C → FF	FF
205	Area	Area	FF	FF	FF
206			Work	00	C → 00
207			Area	0A	0A
208				Work	01
209				Area	00
20A					Work
20B					Area
20C					
20D					
20E					
20F					
210					
211					
212					
213					

Consider now the sequence +, +, -, ABS of operands:

Location (hex)	After +	After +	After -	After ABS
200	T → 00	T → 00	T,C→00	T,C→00
201	00	00	00	00
202	00	C → 00	FE	01
203	08	08	FF	01
204	C → FF	01	Work	Work
205	FF	09	Area	Area
206	01	Work		
207	0A	Area		
208	Work			
209	Area			

If a binary operator is encountered with (TOPSTK) = (CURSTK), perform the operation as usual, except, following the operation, move the result to (TOPSTK)+2 and do not decrement (CURSTK) by two. This feature allows the user to believe there is an infinite stack, initially all zeros. When operands are being entered, check for the stack being full (as it became in this example), and take care to not overflow the space provided.

In next month's column, we implement these ideas in an enhanced version of the integer arithmetic package which now expects reverse Polish entry order. This program also contains other enhancements of the integer arithmetic package. One of them is this month's program, discussed next.

LOOSE ENDS IN BANG

The purpose of most of the logic in BANG was to decode a one byte operator and branch to the appropriate routine. A typical segment was coded:

```
        CMP B #$2B +
        BNE   SUBQ
        JSR   ADDJ  GO ADD
        BRA   BANGN
 SUBQ   CMP B #$2D -
```

This takes 8 or 9 bytes per keyword (operator). It is an easily understood method, but hardly elegent. A fancy way to branch according to a keyword (from a one byte table) involves the simple table lookup subroutine LOOKUP: (see Listing 1)

One can see that this table lookup method requires subroutine LOOKUP (which, except for the user error routine jump, is relocatable and reentrant) to be present only once for all such table search operations. Only 7 bytes plus three bytes per table entry are needed. Since we are processing 7 operators in BANG, we require 20+28=48 bytes and get routine LOOKUP free. This is less than the 60 bytes required by the simpler coding in the first version of BANG.

Since LOOKUP is reentrant, if can (indirectly) call itself. This feature could be used when some keywords have two byte length. An example of this situation is the program by which the flow charts seen in this column are prepared. Most of the keywords are two bytes in length. For example:

DE a decision box

DI a disk box

DO a document box

Keywords are processed as follows: with the first letter (in this example, 'D'):

```
        LDX   #FIRSTT LOAD FIRST LTR TABLE
        JMP   LOOKUP  DECODE
FIRSTT  ...
        FCB   'D      KEYWORD "D"
        FDB   DFIRST  ADDRESS OF D ROUTINE
        ...
DFIRST  JSR   INEEE   GET NEXT BYTE
        TAB           SAVE IN ACCB
        LDX   #DSEC   LOAD SEC LTR TABLE
        JMP   LOOKUP  GO DO IT
DSEC    FCB   'E
        FDB   DECISN
        FCB   'I
        FDB   DISK
        FCB   'O
        FDB   DOCUMT
        FCB   0
```

The routine DECISN also uses LOOKUP since it requires further input (to show which arms on the decision box are desired).

Answers to Exercises:

	Algebraic	Reverse Polish
4.	A+B*C	ABC*+
5.	A/B-C*D	AB/CD*-
6.	A*(B+C*D/(E-F))	ABCD*EF-/+*

```
*
*       SUBROUTINE LOOKUP
*
*  ENTRY:  X POINTS TO THE KEYWORD-BRANCH
*       ADDRESS TABLE.  ACCB CONTAINS
*       THE ONE BYTE KEY.
*
*  EXIT:  IF FOUND, A JUMP TO THE ADDRESS
*       FOLLOWING THE MATCH IN THE TABLE
*       IS EXECUTED.  IF NOT FOUND, A JUMP
*       TO ERROR ROUTINE USRERR WITH ACCA
*       CONTAINING 01 IS EXECUTED.
*
LOOKUP  LDA A 0,X     LOAD KEYWORD
        BEQ   TABEND  TEST IF END
```

```
         CBA             SEE IF MATCH
         BEQ    FOUND
         INX
         INX             SKIP PAST ADR
         INX
         BRA    LOOKUP
FOUND    LDX    1,X      MATCH: LOAD ADDRESS
         JMP    0,X      AND BRANCH
TABEND   INC A           SHOW ERROR CODE 1
         JMP    USRERR   FOR RUNNING OUT TBL
*
*  EXAMPLE TABLE FOR BANG
*
BANGTA   FCB    '+       ADDITION
         FDB    ADDI
         FCB    '-       SUBTRACTION
         FDB    SUBI
         FCB    '*       MULTIPLICATION
         FDB    MULI
         FCB    '/       DIVISION
         FDB    DIVI
         FCB    'R       REMAINDER
         FDB    REMI
         FCB    'A       ABS VALUE
         FDB    ABSI
         FCB    'N       NEGATION
         FDB    NEGI
         FCB    0        ZERO TERMINATOR
*
*  EXAMPLE USAGE
*
*  ASSUME ACCB CONTAINS THE OPERATOR
*
         LDX    #BANGTA  LOAD TABLE START
         JSR    LOOKUP   ALL ROUTINES ARE
         ...             SUBROUTINES.
```

Listing 1. An example of a table lookup program which can shorten last month's program BANG.

LETTERS

JOHN R. DYE

April 21, 1979

'68' Micro Journal
3018 Hamill Road
Hixson, TN 37343

Attention: Joyce Williams

Dear Sirs:

Just received a (complimentary?) issue of '68' Micro Journal Volume 1, Issue 2, just in the nick of time. I was just about to switch to 6502-based Ohio Scientific as I've given up on trying to upgrade the Heath ET-3400 Trainer -- their (finally!) announced expansion kit still won't get me any closer to mini-floppy configuration which is my ultimate goal.

Now, if you think I'm going to deface this magazine by cutting out your subscription coupon, you're wrong! I hope you can accept this letter in lieu of your form.

Please enter my charter two-year subscription at the $18.50 rate. Charge it to my VISA account Number [redacted]

If it is possible, send me the first issue Volume 1 Issue 1, February to go with my existing March/April issue and rush issue 3, May as soon as it is off the presses.

By the way, my compliments to Mickey Ferguson. His article on the CT-82 Terminal has told me more than either Kilobaud or SWTPC themselves.

Cordially,

John R. Dye

Southwest Technical Products Corporation
219 W. Rhapsody
San Antonio, Texas 78216

May 3, 1979

Dear Editor,

We would like to point out to all users of our system that the story printed in the latest issue of 6800 BITS is very misleading and should be clearified.

Copy of paragraph is enclosed.

This story seems to imply that our 8 inch floppy disk systems are not usable with our computer systems and that even if you manage to get the clock speed up to 1.6 MHz it still will not work because our 32 K memories will not cycle this fast.

What is not mentioned is that the disk system referred to is not the Southwest Technical Products DMF-1 eight inch disk system, but the Smoke Signal Broadcasting eight inch disk system. Our DMF-1 will work just fine with all existing 6800 computer systems. It uses a DMA controller that will properly interface the floppy disk to systems running at 830 to 1200 KHz as most do. The Smoke Signal disk system uses a less expensive controller design that is similar to the technique commonly used with mini-drives in which the processor handles the information coming in from the disk directly. This is fine with mini-drives, but an eight inch drive inputs data to fast for a processor operating at 1.0 MHz or so to keep up. The solution used in the Smoke Signal drive is to operate the processor at 1.6 MHz minimum. The fact that this makes it incompatible with most 6800 CPU's out the \# in the world is never mentioned in any literature, or ad that I have seen.

Southwest Technical Products has always tried to make new equipment as compatible as possible with previous designs and to make upgrades possible where practical. We would like to set the record straight in the above sto y as to exactly where the p oblems and incompatabilities originate.

Sincerely,

Daniel Meyer

Daniel Meyer -Pres.

A STAFF REVIEW
The 68 Micro Journal Lab

The JPC Products Model TC-3 cassette interface is rather unique. It uses only five integrated circuits (including the voltage regulator) on a single glass-epoxy circuit board. It plugs directly into the I/O bus on an SS-50 computer. And it provides a VERY RELIABLE means of saving programs and data to tape at bit rates up to 4800 baud. The TC-3 even includes

provision for automatic motor control for 1-8 drives. Although three drives is really a practical maximum. The TC-3 cassette interface sells for $49.95 from JPC Products, P.O. Box 5615, Albuquerque, New Mexico 87185. JPC Products also offers a cassette operating system for use with the TC-3 for $19.95 additional. We will be considering the TC-3 cassette interface and the CFM/3 cassette operating system as a single product. This is because we feel the average person should consider them as a single product, which sells for sixty nine dollars ninty cents.

The most impressive thing about the TC-3 is the overwhelming amount of documentation. There are twenty-five pages of documentation with the TC-3 and an additional fifty-nine pages with the CFM/3. In addition to the basic assembly instructions, schematics, etc. which we expect to find in a product of this kind; there is a section on tape recorders which makes several recommendations on the selection of a recorder for use with the TC-3. The CFM/3 documentation is really easy to use because the name of the command being described is printed in letters 1/2 inch high at the beginning of the discussion. This makes it very easy to find the command you are looking for. We should also mention that fully anointed listings of all programs & patches are included as part of the documentation.

The basic TC-3 cassette interface includes a set of utility driver subroutines. Also included is a subroutine that allows MIKBUG format Kansas City standard tapes to be loaded. You could write a complete cassette operating system around these subroutines. But why bother? The CFM/3 is a complete cassette operating system. With the CFM/3 operating system, you get patches for SWTPC BASIC, SWTPC CORES editor/assembler, the TSC editor, and TSC assembler. The patches allow you to save and load named files through the CFM/3 file manager. It would be fairly easy to modify BASIC for data files through the file manager, too. But you are on your own there,JPC Products does not provide the necessary patches for that.

In use in the 68 Micro Journal lab, we have found the TC-3 (with CFM/3) to be both fast and reliable. More reliable than our National Multiplex CC-8 digital recorder at 4800 baud, in fact. With the CFM/3 operating system the TC-3 is very convenient to use. Considering the TC-3 cassette interface without the CFM/3 operating system, it earns a 68 Micro Journal lab rating of AA. The hardware is excellent, but the driver subroutines are a bit impractical to use without some additional software to tie it all together. Considering the TC-3 and the CFM/3 together as a single product, the rating must be AAA. Rated AAA because it is an excellent low cost alternative to a floppy disk system for the person on a tight budget.

MEF

BASIC PROGRAMMING QUICKIES

David Eagle
3330 S. Garland Way
Lakewood, CO 80227

Two routines for SWTPC BASIC, Version 2.3.

```
9010 REM ARC-COSINE SUBROUTINE
9020 REM C=ARC COS(X), RADIANS
9030 REM -1 ≤X ≤+1
9040 P0=3.14159265
9050 IF X=0 THEN C=P0/2: RETURN
9060 IF ABS (X) >=1 THEN C=(1-SGN (X))*P0/2: RETURN
9070 C= ATAN (SQR(1-X*X)/X)+(1-SGN (X))*P0/2: RETURN

8000 REM ARC-SINE SUBROUTINE
8010 REM S=ARC SIN(X), RADIANS
8020 REM -1 ≤X ≤+1
8030 P0=3.14159265
8040 IF ABS (X) >= 1 THEN S=SGN (X)*P0/2: RETURN
8050 S=ATAN (X/SQR(1-X*X)): RETURN
```

Submitted by: David Eagle
3330 S. Garland Way
Lakewood, CO 80227
303-985-5049

LOCATE (UPDATE)

Dennis Womack
Rt. 4, 109 Foster Dr.
Ringgold, GA 30736

It was back last August, when Don Williams proded me into writing a program called FILES. I had just installed a SWTPC MP-68 minifloppy on an AMI EVK 6800 computer for my employer. Because of the differences in the monitors, I needed to know where the new MINIFLEX operating system was going to go in memory. The old FDOS had a command called FILES which

would list the directory of files. Each file's starting address, ending address, and transfer address was listed. Don kept saying, "I wish TSC had included a FILES command. Why don't you write one?" (That's the way he is.) My reply was always: "When you get me the 'Advanced Programmers Guide', maybe I will."

In August push turned into shove and the program was written. It had one bug. If the file did not have a transfer address record as the last record, it would not print the ending address of the last memory segment. Other than that, the new FILES.CMD would handle a segmented, binary format file correctly. An example of this kind of file is DOS.SYS, which is composed of many non-contiguous memory segments. FILES.CMD satisfied an immediate need and several people have received copies of it.

As Don was gearing up to do 68 Micro he asked for an article on FILES.CMD. The bug was corrected and a small article was written to accompany the source listing. After some thought, the program was renamed LOCATE.CMD. The new name seemed to make more sense than FILES.

One day after the article had been submitted, Don called. "Guess what? I've got another LOCATE. What do you want to do?" Robert Pigford's article was more tutorial, so Don decided to run it. Robert's article was great. Later, while reading his article, I realized he was not handling segmented, binary files. I am not being critical. His program probably does exactly what he intended. Segmented, binary files are created when you:
1. append two or more binary files, or
2. segment an assembly language program (ie: with RMB's).

The irony of it all, is that two people, independently, used the same name for a program, which did nearly the same thing. Truth is stranger than fiction...

I am not going to discuss how FLEX handles files. Read Robert Pigford's LOCATE in the last issue for that. Better yet, buy the "Advanced Programmer's Guide". What follows is a description of how segmented, binary files are handled.

LOCATE functions by opening the specified file for read, and then reading the file record by record. As each record is read, the program decides how to handle it. Transfer addresses are saved, and a flag is set to indicate there is a transfer address for the file. When a binary record is read, it is determined if this record is contiguous with the last binary record. If it is not, then the starting and ending addresses of the last contiguous segment are printed and a new segment is started. When the end-of-file error occurs the program finishes by printing the starting and ending addresses for the current segment. It then prints the transfer address, if any. To use this utility simply type "LOCATE (FILE SPEC)". Happy hunting.

```
        NAM    LOCATE 1/27/79
**
* LOCATE UTILITY
*
* THIS PROGRAM READS A BINARY FILE AND
* LISTS EACH SEGMENT OF MEMORY LOADED.
* THE ULTIMATE TRANSFER ADDRESS (IF ANY)
* IS ALSO LISTED.
*
* TO USE:
* TYPE "LOCATE,(FILE SPEC)"
*
* WRITTEN BY DENNIS WOMACK
* COPYRIGHT JANUARY 27, 1979
* ALL RIGHTS RESERVED
**

*
* ROUTINES USED FROM MINIFLEX
*
WARMS   EQU    $7103      DOS WARM START ENTRY
GETFIL  EQU    $7127      GET FILE SPECS
PUTCHR  EQU    $7112      O/P AR
PSTRNG  EQU    $7118      O/P CRLF THEN STRING
PCRLF   EQU    $711E      O/P CRLF
SETEXT  EQU    $712D      SET DEFAULT EXT
OUTHEX  EQU    $7139      O/P 2 HEX DIGITS
RPTERR  EQU    $713C      REPORT DISK ERROR
FMS     EQU    $7806      FMS CALL ENTRY
FMSCLS  EQU    $7803      FMS CLOSE ENTRY
*
* FILE CONTROL BLOCK
*
FCB     EQU    $7740      SYSTEM FCB
*
```

```
                   * LOCATE UTILITY
                   *
1000                       ORG     $1000
1000 20 01         LOCATE  BRA     LOC1
                   *
1002 02                    FCB     2          VERSION NUMBER
                   *
1003 BF 11 36      LOC1    STS     STEMP      SAVE CURRENT STACK REG
1006 7F 11 28              CLR     TFLAG      SET TA FLAG TO NO TA
1009 CE 77 40              LDX     #FCB       POINT TO FCB
100C BD 71 27              JSR     GETFIL     GET FILE SPEC
100F 24 03                 BCC     LOC2       ANY ERRORS?
1011 7E 10 D9              JMP     LOC14      YES, GO HANDLE
1014 CE 77 40      LOC2    LDX     #FCB       NO, POINT TO FCB
1017 86 00                 LDA A   #0         SETUP .BIN
1019 BD 71 2D              JSR     SETEXT     DEFAULT
101C CE 77 40              LDX     #FCB       POINT TO FCB
101F 86 01                 LDA A   #1         OPEN FOR READ CODE
1021 A7 00                 STA A   0,X        STORE IN FCB
1023 BD 78 06              JSR     FMS        DO OPEN FUNC
1026 27 03                 BEQ     LOC3       ERRORS?
1028 7E 10 CB              JMP     LOC12      YES, GO HANDLE
102B 86 FF         LOC3    LDA A   #$FF       NO
102D A7 3B                 STA A   59,X       INHIBIT SP COMP
102F BD 71 1E              JSR     PCRLF      PRINT CRLF
1032 BD 71 1E              JSR     PCRLF      PRINT CRLF
                   *
                   * READ A RECORD
                   *
1035 BD 10 EA      LOC4    JSR     LOC17      GET NEXT BYTE
1038 81 02                 CMP A   #$02       BYTE=2?
103A 27 14                 BEQ     LOC6       YES, HANDLE BINARY REC
103C 81 16                 CMP A   #$16       BYTE=$16?
103E 27 02                 BEQ     LOC5       YES, HANDLE TA REC
1040 20 F3                 BRA     LOC4       NO, GO GET NEXT BYTE
                   *
                   * TRANSFER ADDRESS RECORD HANDLER
                   *
1042 BD 10 FB      LOC5    JSR     LOC19      GET NEXT 2 BYTES AS ADDR
1045 FE 11 34              LDX     XTEMP      ADDR IS IN XTEMP
1048 FF 11 2A              STX     TADDR      MOVE TO TADDR
104B 7C 11 28              INC     TFLAG      BUMP FLAG TO YES
104E 20 E5                 BRA     LOC4       GO READ ANOTHER RECORD
                   *
                   * BINARY RECORD HANDLER
                   *
1050 BD 10 FB      LOC6    JSR     LOC19      GET NEXT 2 BYTES AS ADDR
1053 FE 11 34              LDX     XTEMP      ADDR IS IN XTEMP
1056 FF 11 30              STX     BEGREC     BEGINNING OF REC=ADDR
1059 BD 10 EA              JSR     LOC17      GET NEXT BYTE
105C B7 11 27              STA A   COUNT      SAVE AS COUNT
105F 4A                    DEC A
1060 BB 11 31              ADD A   BEGREC+1   ADD COUNT-1 TO
1063 B7 11 33              STA A   ENDREC+1   BEGINNING OF RECORD
1066 86 00                 LDA A   #0         SAVE IT AT
1068 B9 11 30              ADC A   BEGREC     END OF RECORD
106B B7 11 32              STA A   ENDREC
106E BD 10 EA      LOC7    JSR     LOC17      READ REST OF RECORD
1071 7A 11 27              DEC     COUNT
```

```
1074 26 F8              BNE     LOC7
1076 FE 11 2E           LDX     ENDSEG
1079 08                 INX
107A BC 11 30           CPX     BEGREC      1+ENDSEG=BEGREC?
107D 26 08              BNE     LOC8        NO, HANDLE AS NOT CONTINUOUS
107F FE 11 32           LDX     ENDREC
1082 FF 11 2E           STX     ENDSEG      ENDSEG=ENDREC
1085 20 AE              BRA     LOC4        READ ANOTHER RECORD
               *
1087 7D 11 29  LOC8     TST     SKIP
108A 26 03              BNE     LOC9        SKIP FIRST PRINT
108C BD 11 06           JSR     LOC20       PRINT BEG + END OF SEG
108F 7F 11 29  LOC9     CLR     SKIP
1092 FE 11 30           LDX     BEGREC
1095 FF 11 2C           STX     BEGSEG      BEGSEG=BEGREC
1098 FE 11 32           LDX     ENDREC
109B FF 11 2E           STX     ENDSEG      ENDSEG=ENDREC
109E 20 95              BRA     LOC4        READ ANOTHER RECORD
               *
               * END OF FILE HANDLER
               *
10A0 BD 11 06  LOC10    JSR     LOC20       PRINT BEG AND END OF SEG
10A3 7D 11 28           TST     TFLAG       TRANSFER ADDR?
10A6 27 12              BEQ     LOC11       NO, SKIP TA PRINT
10A8 CE 11 57           LDX     #MSG1
10AB BD 71 18           JSR     PSTRNG
10AE CE 11 2A           LDX     #TADDR
10B1 BD 71 39           JSR     OUTHEX      PRINT TA MSB
10B4 CE 11 2B           LDX     #TADDR+1
10B7 BD 71 39           JSR     OUTHEX      PRINT TA LSB
10BA BD 71 1E  LOC11    JSR     PCRLF       PRINT CRLF
10BD CE 77 40           LDX     #FCB
10C0 86 04              LDA A   #4          YES, CLOSE FILE CODE
10C2 A7 00              STA A   0,X         STORE IN FCB
10C4 BD 78 06           JSR     FMS         DO CLOSE FILE
10C7 26 15              BNE     LOC15       ERRORS?
10C9 20 19              BRA     LOC16       NO, RETURN TO FLEX
               *
               * ERROR HANDLER
               *
10CB A6 01     LOC12    LDA A   1,X         GET ERROR STATUS
10CD 81 04              CMP A   #4          IS IT "NO FILE"
10CF 26 0D              BNE     LOC15
10D1 CE 11 38           LDX     #NOFST      YES, PT TO MSG
10D4 BD 71 18  LOC13    JSR     PSTRNG      O/P MESSAGE
10D7 20 0B              BRA     LOC16       RETURN TO FLEX
               *
10D9 CE 11 45  LOC14    LDX     #ILLST      PT TO MSG
10DC 20 F6              BRA     LOC13
               *
10DE BD 71 3C  LOC15    JSR     RPTERR      REPORT DISK ERROR
10E1 BD 78 03           JSR     FMSCLS      CLOSE ALL FILES
10E4 BE 11 36  LOC16    LDS     STEMP       RESTORE STACK
10E7 7E 71 03           JMP     WARMS       RETURN TO FLEX
               *
               * GET NEXT BYTE ROUTINE
               *
10EA CE 77 40  LOC17    LDX     #FCB
10ED BD 78 06           JSR     FMS         GET NEXT BYTE
```

```
10F0 27 08              BEQ    LOC18
10F2 A6 01              LDA A  1,X       GET ERROR STATUS
10F4 81 08              CMP A  #B        IS IT EOF?
10F6 26 E6              BNE    LOC15     NO, ERROR
10F8 20 A6              BRA    LOC10     YES, GO HANDLE
10FA 39        LOC18    RTS
               *
               * GET NEXT TWO BYTES FOR ADDR ROUTINE
               *
10FB 8D ED     LOC19    BSR    LOC17     GET NEXT BYTE
10FD B7 11 34           STA A  XTEMP     XTEMP MSB=NEXT BYTE
1100 8D E8              BSR    LOC17     GET NEXT BYTE
1102 B7 11 35           STA A  XTEMP+1   XTEMP LSB=NEXT BYTE
1105 39                 RTS
               *
               * PRINT BEGINNING AND END OF SEGMENT ROUTINE
               *
1106 CE 11 2C  LOC20    LDX    #BEGSEG
1109 BD 71 39           JSR    OUTHEX    PRINT BEGSEG MSB
110C CE 11 2D           LDX    #BEGSEG+1
110F BD 71 39           JSR    OUTHEX    PRINT BEGSEG LSB
1112 86 2D              LDA A  #'-
1114 BD 71 12           JSR    PUTCHR    PRINT "-"
1117 CE 11 2E           LDX    #ENDSEG
111A BD 71 39           JSR    OUTHEX    PRINT ENDSEG MSB
111D CE 11 2F           LDX    #ENDSEG+1
1120 BD 71 39           JSR    OUTHEX    PRINT ENDSEG LSB
1123 BD 71 1E           JSR    PCRLF     PRINT CRLF
1126 39                 RTS
               *
               * VARIABLES
               *
1127 00        COUNT    FCB    0         BYTE COUNT
1128 00        TFLAG    FCB    0         TRANSFER ADDR FLAG, O=NO
1129 FF        SKIP     FCB    $FF       SKIP FIRST PRINT FLAG
112A 00 00     TADDR    FDB    0         TRANSFER ADDR
112C 00 00     BEGSEG   FDB    0         BEGINNING OF SEGMENT
112E 00 00     ENDSEG   FDB    0         END OF SEGMENT
1130 00 00     BEGREC   FDB    0         BEGINNING OF RECORD
1132 00 00     ENDREC   FDB    0         END OF RECORD
1134 00 00     XTEMP    FDB    0         TEMPORARY FOR XR
1136 00 00     STEMP    FDB    0         STACK REG SAVE
               *
               * STRINGS FOR ERROR MESSAGES
               *
1138 4E        NOFST    FCC    /NO SUCH FILE/
1139 4F 20
113B 53 55
113D 43 48
113F 20 46
1141 49 4C
1143 45
1144 04                 FCB    4
1145 49        ILLST    FCC    /ILLEGAL FILE NAME/
1146 4C 4C
1148 45 47
114A 41 4C
114C 20 46
114E 49 4C
```

```
        1150 45 20
        1152 4E 41
        1154 4D 45
203     1156 04                  FCB     4
204     1157 54         MSG1     FCC     /TRANSFER ADDRESS=$/
        1158 52 41
        115A 4E 53
        115C 46 45
        115E 52 20
        1160 41 44
        1162 44 52
        1164 45 53
        1166 53 3D
        1168 24
205     1169 04                  FCB     4
206                              END     LOCATE

NO ERROR(S) DETECTED

  SYMBOL TABLE:

BEGREC 1130   BEGSEG 112C   COUNT  1127   ENDREC 1132   ENDSEG 112E
FCB    7740   FMS    7806   FMSCLS 7803   GETFIL 7127   ILLST  1145
LOC1   1003   LOC10  10A0   LOC11  10BA   LOC12  10CB   LOC13  10D4
LOC14  10D9   LOC15  10DE   LOC16  10E4   LOC17  10EA   LOC18  10FA
LOC19  10FB   LOC2   1014   LOC20  1106   LOC3   102B   LOC4   1035
LOC5   1042   LOC6   1050   LOC7   106E   LOC8   1087   LOC9   108F
LOCATE 1000   MSG1   1157   NOFST  1138   OUTHEX 7139   PCRLF  711E
PSTRNG 7118   PUTCHR 7112   RPTERR 713C   SETEXT 712D   SKIP   1129
STEMP  1136   TADDR  112A   TFLAG  1128   WARMS  7103   XTEMP  1134
```

BASIC RENUMBERING

for
Southwest Tech BASIC

Mickey Ferguson
PO Box 708
Trenton, GA 30752

Did you ever program yourself into a corner? Surely you have decided to write some simple little program while sitting at your terminal. And as you progress, the little program grows becoming much less simple. Then you find it will run properly if you add a line between lines 80 and 90. But you have used ALL possible line numbers from 80 to 90. So, you start re-entering lines, renumbering them as you go. And trying not to make any mistakes. Or you might just want to impress your friends by always having all of your programs begin with line 10 and all line numbers incremented by 10. It sure makes it appear that you knew exactly what you were doing when you wrote the program. Using the program included with this article will get you out of those corners we all sometimes get ourselves into. And if you don't tell your friends about it, I won't either.

The RENUM program renumbers the program currently resident in memory. The first line number after renumbering is 10, and all line numbers are incremented by 10. As presented here, RENUM is written to be used as a FLEX utility but returns control to BASIC instead of to FLEX. It is assembled for a starting address of $C000 because I had some memory there, and because it can be called from the SWTBUG "Z" command once it is in memory. You may assemble it for any location in memory conveinent for you. And you could even assemble it to reside contiguous with BASIC (providing you lock out BASIC to keep RENUM from being overwritten by BASIC). RENUM is written for SWTPC Disk BASIC Version 3.0 for the FLEX operating system. But it is easily modified for use with any of the BASIC's written by Robert Uiterwyk. And I will give you the patches for SWTPC's 8k Version 2.0 and miniFlex

BASICs. But first, let's look at how RENUM works.

I will not discuss the operation of RENUM in minute detail, because (hopefully) the source is commented well enough to make that unnecessary. RENUM runs in two passes through the BASIC program. During the first pass, a lookup table is built in memory following the BASIC program. In the second pass, all line numbers in the BASIC program are replaced with the new line numbers from the table. An entry in the lookup table consists of the old line number followed by the new line number. In the table the line numbers are stored in packed BCD (Binary Coded Decimal) format; thus each entry in the table requires four bytes to store two line numbers. RENUM has to use a lookup table because there is no way for a program to calculate a new line number based on the old one. If humans were as logical as computers, it would be simple to devise a method to calculate the new line numbers. But then renumbering programs would be unnecessary.

BASIC adds its share of headaches for RENUM during the second pass. As I've already mentioned, line numbers are stored in packed BCD format. But this is not the case when a line number is used in a BASIC statement (like: GOTO 200). Line numbers referenced in a BASIC statement are stored in ASCII format. So RENUM must be able to recognize both BCD and ASCII line numbers, and be able to distinguish them from constants used in the BASIC program. If this weren't enough, BASIC further complicates things by converting the first keyword used in a statement to a token. While any subsequent keywords are merely stored in ASCII. (Your BASIC programs would run a lot faster if ALL keywords were converted to tokens.) So RENUM must be able to recognize keywords in ASCII and by their tokens. The tokens BASIC uses can be considered to be "a pointer to a pointer". The token is the address of the pointer to the keyword routine in BASIC's lookup table. The source for one entry in BASIC's lookup table looks something like this:

```
FCC /GOTO/
FCB 0
FDB GOTO ---the token points to here
```

It would be very helpful to RENUM if BASIC did not allow multiple statement lines. Or very complex single statement lines like:

```
IF X=1 THEN IF Y=2 THEN ON Z GOTO 100,200
```

But BASIC does allow all these things and we would be very unhappy if it didn't. So RENUM must allow for them as well. Additionally, line numbers change in length when a program is renumbered, GOTO 1000 might become GOTO 90. And it would not be desirable to have the line say GOTO 0090 after the program is renumbered. So RENUM supressea leading zeros. But GOTO 90 could become GOTO 100 and might look like GOTO100 after renumbering. So RENUM opens up the necessary room when a line number grows.

If you are very familiar with the internal workings of your BASIC, you will notice there are routines in RENUM that are also in BASIC. If you are that familiar with your BASIC, I would recommend using the routines in BASIC, instead of duplicating them in RENUM. You might also incorporate RENUM into your BASIC's keyword table and add an optional argument. So that you could say RENUM,200. And your program would be renumbered beginning with line number 200. A second argument could be added to specify the increment value. These changes would be quite simple to implement; but should not be attempted unless you really understand how your BASIC works. I chose not to do this here to make it easier to patch RENUM for different versions of BASIC. Speaking of patching RENUM for different versions of BASIC; only one change is necessary for RENUM to run with miniFLEX BASIC. You will note the line in the SYSTEM EQUATES that says:

```
BASERR EQU $CE9
```

For RENUM to work with miniFLEX BASIC, this line must be changed to:

```
BASERR EQU $CE6
```

For RENUM to run with SWTPC 8k BASIC Version 2.0, three changes must be made. As above, the BASERR line must be changed and should read:

```
BASERR EQU $BEB
```

In 8k V2.0 the tokens for GOTO and GOSUB are $022D & $0234 respectively. This requires two changes to the RENUM6 routine. The source as shown reads:

```
CMP A #2
BNE   RENU65
CMP B #$30
BEQ   GO
CMP B #$37
BEQ   GO
```

To use RENUM with 8k BASIC V2.0 this code must be changed to read as follows:

```
CMP A #2
BNE   RENU65
CMP B #$2D
BEQ   GO
CMP B #$34
BEQ   GO
```

One word of caution. It is wise to save a copy of your BASIC program to tape or disk prior to renumbering it. Should RENUM encounter an error (GOTO 200 - when there is no line 200, for example), the renumbering process is halted and control is given to BASIC through its error handling routine. If this occurs your program will be in a partially renumbered state, and completely useless to either BASIC, RENUM, or to you. All you have to do is lose a two or three hundred line program and you will really appreciate that backup copy.

As I mentioned earlier, you should be able to get RENUM to run with any of Robert Uiterwyk's BASICs. This includes MSI BASIC, Computerware BASIC, and PERCOM SuperBASIC. And possibly others that I am not aware of. All you need to know to modify RENUM for these different BASICs is:

1.- The address of BASIC's error handling routine
2.- The tokens for GOTO and GOSUB
3.- The memory locations used for NEXTBA, SOURCE, MSLINE, & LSLINE (if different from those shown in the listing)

But don't ask me about a version for SWTPC 4k BASIC. I wrote a renumbering program for 4k BASIC about two and one half years ago. And sold an article about it to Kilobaud - it has never been published. So if you need renumbering for SWTPC 4k BASIC; write to Kilobaud, not to me.

SYMBOL TABLE:

```
ASCON  C14E   ASTM1  C2CB
BASERR 0CE9   BCDCH1 C1C0
BCDCO2 C1DB   BCDCO3 C1F4
DEXGET C148   FNDL11 C197
FNDLIN C18B   GO     C0AF
GO35   C103   GO4    C10A
GO6    C12C   GO7    C142
LSLINE 0033   MOVE1  C277
ON     C1FD   ON1    C200
RENU00 C006   RENU45 C063
RENUM0 C009   RENUM1 C013
RENUM6 C086   RESTRT 0103
SOURCE 002E   TEMP1  C2C1
TEMP5  C2C9   THEN   C20F
TSTNO2 C2B3   TSTNUM C14B
ASTM2  C2CC   ASTM3  C2CD
BCDCH2 C1D6   BCDCH3 C1EB
BCDCON C1B0   CLOSU1 C286
FNDL15 C19E   FNDLI1 C18D
GO1    C0BD   GO2    C0D5
GO44   C11C   GO45   C11F
GO8    C145   GOSUB  C24B
MOVRTS C281   MSLINE 0032
ON2    C204   ON3    C208
RENU55 C080   RENU65 C0AC
RENUM3 C03F   RENUM4 C057
SKIP1  C2B6   SKIP2  C2BF
TEMP2  C2C3   TEMP3  C2C5
THEN1  C224   TSTNO  C2A7
TSTOVF C25B
       ASTM4  C2CE
       BCDCO1 C1C9
       CLOSUP C283
       FNDLI2 C1A4
       GO3    C0F0
       GO5    C126
       GOTO   C230
       NEXTBA 002A
       ON4    C20C
       RENUM  C000
       RENUM5 C079
       SKIPSP C2BC
       TEMP4  C2C7
       TSTNO1 C2B0
```

```
                         NAM     RENUMBER
                   *
                   * BASIC PROGRAM RENUMBERING FOR
                   * SWTPC DISK BASIC V3.0 FLEX
                   *
                   * SYSTEM EQUATES
                   *
002A               NEXTBA  EQU     $2A         POINTER TO FIRST BYTE AFTER PROGRAM
002E               SOURCE  EQU     $2E         POINTER TO BEGINNING OF PROGRAM
0032               MSLINE  EQU     $32         TOP HALF OF HIGHEST LINE # IN PROGRAM
0033               LSLINE  EQU     $33         BOTTOM HALF OF HIGHEST LINE #
0103               RESTRT  EQU     $103        BASIC WARM START ENTRY
0CE9               BASERR  EQU     $CE9        BASIC'S ERROR ROUTINE
C000                       ORG     $C000       OR WHEREVER HANDY
                   *
                   *CHECK TO SEE IF SOURCE PROGRAM IS PRESENT
                   *
C000 DE 2A         RENUM   LDX     NEXTBA      GET FIRST BYTE AFTER BASIC SOURCE
C002 9C 2E                 CPX     SOURCE      SAME AS FIRST BYTE OF BASIC SOURCE?
C004 26 03                 BNE     RENUM0      IF NOT,GO RENUMBER
C006 7E 01 03      RENU00  JMP     RESTRT      BACK TO BASIC WARM START
                   *
                   *START PASS ONE
                   *BUILD TABLE OF LINE NUMBERS FOLLOWING
                   *THE SOURCE PROGRAM IN MEMORY
                   *EACH ENTRY CONSISTS OF FOUR BYTES
                   *THE FIRST TWO ARE THE OLD LINE NO. IN BCD
                   *THE NEXT TWO ARE THE NEW LINE NO. IN BCD
                   *
C009 FF C2 C5      RENUM0  STX     TEMP3       POINTER TO END OF LINE NUMBER TABLE
C00C 4F                    CLR A               INIT LINE NO COUNTER
C00D 97 32                 STA A   MSLINE
C00F 97 33                 STA A   LSLINE
C011 DE 2E                 LDX     SOURCE      POINT TO SOURCE START
C013 A6 00         RENUM1  LDA A   0,X         GET LINE NO.
C015 E6 01                 LDA B   1,X
C017 FF C2 C3              STX     TEMP2       SAVE SOURCE POINTER
C01A FE C2 C5              LDX     TEMP3       GET LINE NO. TABLE POINTER
C01D A7 00                 STA A   0,X         PUT LINE NO. IN TABLE
C01F E7 01                 STA B   1,X
C021 08                    INX                 BUMP THE POINTER
C022 08                    INX                 AND AGAIN
C023 96 33                 LDA A   LSLINE      GET LSB OF LAST NEW LINE NO.
C025 8B 0A                 ADD A   #10         ADD TEN TO IT
C027 19                    DAA                 BE SURE IT IS DECIMAL
C028 97 33                 STA A   LSLINE      PUT BACK NEW LSD OF LINE NO.
C02A 96 32                 LDA A   MSLINE      GET MSB OF LAST NEW LINE NO.
C02C 89 00                 ADC A   #0          ADD CARRY TO IT
C02E 19                    DAA                 BE SURE IT IS DECIMAL
C02F 97 32                 STA A   MSLINE      PUT BACK NEW MSB OF LINE NO.
C031 D6 33                 LDA B   LSLINE      GET LSB OF NEW LINE NO.
C033 A7 00                 STA A   0,X         PUT NEW LINE NO. IN TABLE
C035 E7 01                 STA B   1,X
C037 08                    INX                 BUMP END OF TABLE POINTER
C038 08                    INX
C039 FF C2 C5              STX     TEMP3       SAVE IT
C03C FE C2 C3              LDX     TEMP2       GET SOURCE POINTER
C03F 9C 2A         RENUM3  CPX     NEXTBA      ARE WE DONE?
C041 27 14                 BEQ     RENUM4      IF YES, DO SECOND PASS
C043 08                    INX                 BUMP THE SOURCE POINTER
```

```
C044 A6 00              LDA A  0,X       GET A BYTE OF SOURCE
C046 26 F7              BNE    RENUM3    BRANCH IF NOT END OF LINE
C048 FF C2 C7           STX    TEMP4     SAVE SOURCE POINTER
C04B F6 C2 C4           LDA B  TEMP2+1   GET OLD SOURCE POINTER+1
C04E 5C                 INC B            ADD 1 TO IT
C04F F1 C2 C8           CMP B  TEMP4+1   CHECK FOR LINE NO. ENDING IN 00
C052 27 EB              BEQ    RENUM3
C054 08                 INX              BUMP THE SOURCE POINTER
C055 20 BC              BRA    RENUM1    REPEAT
                *
                *START PASS TWO
                *
C057 FE C2 C5   RENUM4  LDX    TEMP3     GET END OF TABLE POINTER
C05A 09                 DEX              DECREMENT THE END OF TABLE POINTER TO
C05B 09                 DEX              POINT TO ACTUAL END OF TABLE
C05C 09                 DEX
C05D 09                 DEX
C05E FF C2 C5           STX    TEMP3     SAVE END OF TABLE POINTER
C061 DE 2E              LDX    SOURCE    GET POINTER TO SOURCE BEGINNING
                *
                *REPLACE BCD LINE NUMBER HERE
                *
C063 9C 2A      RENU45  CPX    NEXTBA    DONE?
C065 27 9F              BEQ    RENU00
C067 FF C2 C9           STX    TEMP5     SAVE POINTER TO START OF SOURCE LINE
C06A A6 00              LDA A  0,X       GET LINE NO. FROM LINE
C06C E6 01              LDA B  1,X
C06E B7 C2 C1           STA A  TEMP1     SAVE IT
C071 F7 C2 C2           STA B  TEMP1+1
C074 FF C2 C3           STX    TEMP2     SAVE SOURCE POINTER
C077 DE 2A              LDX    NEXTBA    POINT TO START OF LINE NO. TABLE
C079 A6 00      RENUM5  LDA A  0,X       GET MSB OF LINE NO. FROM TABLE
C07B B1 C2 C1           CMP A  TEMP1     IS IT THE ONE WE WANT?
C07E 27 06              BEQ    RENUM6
C080 08         RENU55  INX              NO. POINT TO NEXT ENTRY
C081 08                 INX
C082 08                 INX
C083 08                 INX
C084 20 F3              BRA    RENUM5    REPEAT
C086 E6 01      RENUM6  LDA B  1,X       GET LSB OF LINE NO. FROM TABLE
C088 F1 C2 C2           CMP B  TEMP1+1   IS IT THE ONE WE WANT?
C08B 26 F3              BNE    RENU55    IF NOT REPEAT
C08D A6 02              LDA A  2,X       YES. GET NEW NO. FROM TABLE
C08F E6 03              LDA B  3,X
C091 FE C2 C3           LDX    TEMP2     GET SOURCE POINTER
C094 A7 00              STA A  0,X       PUT NEW NO. IN TABLE
C096 E7 01              STA B  1,X
C098 08                 INX              BUMP THE SOURCE POINTER
C099 08                 INX
C09A A6 00              LDA A  0,X       GET MSB OF KEYBYTE FROM SOURCE
C09C E6 01              LDA B  1,X       GET LSB OF KEYBYTE FROM SOURCE
C09E 08                 INX              BUMP THE SOURCE POINTER
C09F 08                 INX
                *
                *LOOK FOR TOKEN FOR GOTO & GOSUB
                *THESE ARE $0237 & $0230
                *
C0A0 81 02              CMP A  #2        IS MSB THE ONE WE WANT?
C0A2 26 08              BNE    RENU65
C0A4 C1 30              CMP B  #$30      IS IT A GOSUB?
```

```
C0A6 27 07                BEQ    GO
C0A8 C1 37                CMP B  #$37      IS IT A GOTO?
C0AA 27 03                BEQ    GO
C0AC 7E C1 FD   RENU65    JMP    ON
                *
                *REPLACE OLD ASCII LINE NUMBER WITH NEW ASCII
                *LINE NUMBER AND DELETE LEADING ZEROS

                *
C0AF 86 FF      GO        LDA A  #$FF      PRESET ASCII LINE NO STORAGE
C0B1 B7 C2 CB             STA A  ASTM1     MSB
C0B4 B7 C2 CC             STA A  ASTM2
C0B7 B7 C2 CD             STA A  ASTM3
C0BA B7 C2 CE             STA A  ASTM4     LSB
C0BD 08         GO1       INX              INC. POINT,SKIP SPACE, GET BYTE
C0BE A6 00                LDA A  0,X
C0C0 27 13                BEQ    GO2       BRANCH ON END OF LINE
C0C2 81 2C                CMP A  #$2C      IS IT A COMMA?
C0C4 27 0F                BEQ    GO2
C0C6 81 3A                CMP A  #$3A      IS IT A COLON?
C0C8 27 0B                BEQ    GO2
C0CA 81 20                CMP A  #$20      IS IT A SPACE?
C0CC 27 07                BEQ    GO2
C0CE 8D 7B                BSR    TSTNUM    TEST FOR NUMERIC CHAR.
C0D0 24 EB                BCC    GO1       BRANCH IF NUMERIC
C0D2 7E C2 00             JMP    ON1
C0D5 8D 71      GO2       BSR    DEXGET    DEC POINTER + GET BYTE
C0D7 B7 C2 CE             STA A  ASTM4     PUT IN ASCII TEMP
C0DA 8D 6C                BSR    DEXGET    GET ANOTHER
C0DC 25 12                BCS    GO3       BRANCH IF NOT NUMERIC
C0DE B7 C2 CD             STA A  ASTM3     PUT IN ASCII TEMP
C0E1 8D 65                BSR    DEXGET
C0E3 25 0B                BCS    GO3
C0E5 B7 C2 CC             STA A  ASTM2
C0E8 8D 5E                BSR    DEXGET
C0EA 25 04                BCS    GO3
C0EC B7 C2 CB             STA A  ASTM1
C0EF 09                   DEX              DECREMENT SOURCE POINTER
C0F0 08         GO3       INX              BUMP SOURCE POINTER
C0F1 FF C2 C3             STX    TEMP2     SAVE SOURCE POINTER
C0F4 8D 58                BSR    ASCON     RETURN WITH NEW LINE NO. IN ASCII
C0F6 FE C2 C3             LDX    TEMP2     GET SOURCE POINTER
C0F9 B6 C2 CB             LDA A  ASTM1     GET MSB ON NEW NO.
C0FC 81 30                CMP A  #$30      IS IT ZERO?
C0FE 26 03                BNE    GO35
C100 BD C2 83             JSR    CLOSUP    DELETE IT IF ZERO
C103 81 FF      GO35      CMP A  #$FF      IS IT NOT USED?
C105 27 03                BEQ    GO4
C107 A7 00                STA A  0,X       PUT IT IN SOURCE
C109 08                   INX              BUMP THE SOURCE POINTER
C10A B6 C2 CC   GO4       LDA A  ASTM2     GET NEXT DIGIT
C10D 81 30                CMP A  #$30      IS IT ZERO?
C10F 26 0E                BNE    GO45
C111 F6 C2 CB             LDA B  ASTM1     GET MS DIGIT
C114 C1 30                CMP B  #$30      IS IT ALSO A ZERO?
C116 27 04                BEQ    GO44
C118 C1 FF                CMP B  #$FF      IS MS DIGIT NOT USED?
C11A 26 03                BNE    GO45
C11C BD C2 83   GO44      JSR    CLOSUP    DELETE LEADING ZEROS
C11F 81 FF      GO45      CMP A  #$FF      IS DIGIT NOT USED?
```

```
C121 27 03               BEQ     GO5
C123 A7 00               STA A   0,X       PUT DIGIT IN SOURCE
C125 08                  INX               BUMP THE SOURCE POINTER
C126 B6 C2 CD  GO5       LDA A   ASTM3     GET NEXT DIGIT
C129 A7 00               STA A   0,X       PUT IT IN SOURCE
C12B 08                  INX               BUMP THE SOURCE POINTER
C12C B6 C2 CE  GO6       LDA A   ASTM4     GET LS DIGIT
C12F BD C2 5B            JSR     TSTOVF    GOT TEST FOR OVERFLOW
C132 A7 00               STA A   0,X       PUT LS DIGIT IN SOURCE
C134 BD C2 BC            JSR     SKIPSP    SKIP SPACES+GET CHAR.
C137 81 2C               CMP A   #$2C      IS IT A COMMA?
C139 27 0A               BEQ     GO8
C13B 4D                  TST A             IS IT END OF LINE?
C13C 26 04               BNE     GO7
C13E 08                  INX               BUMP THE SOURCE POINTER
C13F 7E C0 63            JMP     RENU45    DO NEXT LINE
C142 7E C1 FD  GO7       JMP     ON
C145 7E C0 AF  GO8       JMP     GO
C148 09        DEXGET    DEX               DECREMENT SOURCE POINTER
C149 A6 00               LDA A   0,X       GET A BYTE OF SOURCE
C14B 7E C2 A7  TSTNUM    JMP     TSTNO     GO TEST FOR NUMERIC
               *
               *CONVERT ASCII AT ASTM1 THRU 4 TO BCD AT TEMP1
               *
C14E CE 00 00  ASCON     LDX     #0        CLEAR THE INDEX REG
C151 FF C2 C1            STX     TEMP1     CLEAR TEMPORARY
C154 CE C2 C1            LDX     #TEMP1
C157 B6 C2 CE            LDA A   ASTM4     GET LSB OF ASCII LINE NO
C15A 84 0F               AND A   #$F       STRIP OFF ASCII BIAS
C15C A7 01               STA A   1,X       SAVE IT
C15E B6 C2 CD            LDA A   ASTM3     GET NEXT ASCII DIGIT
C161 81 FF               CMP A   #$FF      IS IT USED?
C163 27 26               BEQ     FNDLIN
C165 84 0F               AND A   #$F       STRIP OFF ASCII BIAS
C167 48                  ASL A             SHIFT TO LEFT SIDE OF BYTE
C168 48                  ASL A
C169 48                  ASL A
C16A 48                  ASL A
C16B AB 01               ADD A   1,X       PACK THE BYTE
C16D A7 01               STA A   1,X       SAVE IT
C16F B6 C2 CC            LDA A   ASTM2     GET NEXT ASCII DIGIT
C172 81 FF               CMP A   #$FF      IS IT USED?
C174 27 15               BEQ     FNDLIN
C176 84 0F               AND A   #$F
C178 A7 00               STA A   0,X
C17A B6 C2 CB            LDA A   ASTM1
C17D 81 FF               CMP A   #$FF
C17F 27 0A               BEQ     FNDLIN
C181 84 0F               AND A   #$F
C183 48                  ASL A
C184 48                  ASL A
C185 48                  ASL A
C186 48                  ASL A
C187 AB 00               ADD A   0,X
C189 A7 00               STA A   0,X
               *
               *SEARCH TABLE FOR LINE NO
               *STORED AT TEMP1
               *AND PUT NEW NO AT TEMP1
               *
```

THE TERMINAL-

Until recently all terminal functions were designed with hardware logic. A relatively simple terminal with limited functions could easily require as many as sixty or more integrated circuits. More sophisticated terminals with a moderate amount of intelligence could easily have over a hundred IC's. All this has now changed. With the introduction of MOS video controller circuits it has become possible to design a terminal using a controller and a microprocessor that will perform almost any imaginable function with software. The CT-82 has one hundred twenty-eight separate functions—all of which are software driven. It contains fewer parts than most "dumb" terminals.

The normal screen format is 16 lines (20 lines selectable) with 82 characters per line. This is an upper-lower case display with a 7 x 12 dot matrix. The high resolution characters are displayed on a Motorola Data Products M-2000 series monitor with a green P-31 phosphor. This monitor has a 12 MHz video bandwidth and dynamic focus circuits to insure a crisp well focused display over the entire face of the tube. An alternate all capital letter format is available (optional) with 16, 20 or 22 lines and 92 characters per line. The lower case portion of this character set has graphic symbols. In this mode the lines may be moved together to give a solid figure or line. Direct cursor addressing combined with the plotting capability makes it possible to indicate the end points of a line and then to automatically draw a line between them.

Both the monitor and the character generator have sockets provided for alternate material in the form of an EPROM. This makes it possible to have special terminal functions, or character sets that can be switched in under computer control.

The CT-82 has its own internal editing functions. This allows inserting and deleting lines and characters, erasing quadrants, or lines; doing rolls, scrolls, slides and other similar functions. The CT-82 can block transmit completed material to the computer, or output material to its own remote printer through the built-in parallel printer I/O port. The terminal can be programmed to operate at any system baud rate that is normally used from 50 to 38,400. The baud rate may be changed at any time within this range with a software command.

The cursor position, type of cursor, cursor ON-OFF and blinking are all provided. A command is provided to print control characters and also to turn on and off a tape punch, or tape reader. Protected fields, shift inversion, dual intensity and many other miscellaneous features make the CT-82 one of the most flexible terminals available.

A fifty-six key alphanumeric keyboard plus a twelve key cursor pad is standard. A numeric pad may be substituted for the cursor pad (optional). Connection to the terminal is through a standard DB-25 connector and RS-232 signal levels. The CT-82 operates from 100, 115, 220, or 240 VAC at 50 to 60 Hz. It weighs 20 lbs, and is a compact 18" wide, 10" high and 18" deep.

CT-82 Intelligent Terminal

assembled and tested . . . $795.00 F.O.B. San Antonio

SOUTHWEST TECHNICAL PRODUCTS CORPORATION
219 W. Rhapsody
San Antonio, Texas 78216
(512) 344-0241

```
C18B DE 2A      FNDLIN  LDX     NEXTBA      GET START OF TABLE POINTER
C18D BC C2 C5   FNDLI1  CPX     TEMP3       REACHED END OF TABLE?
C190 26 05              BNE     FNDL11
C192 C6 07              LDA B   #7          ERROR
C194 7E 0C E9           JMP     BASERR      GO REPORT
C197 A6 00      FNDL11  LDA A   0,X         GET MSB OF NO FROM TABLE
C199 B1 C2 C1           CMP A   TEMP1       IS IT THE ONE WE WANT?
C19C 27 06              BEQ     FNDLI2
C19E 08         FNDL15  INX                 POINT TO NEXT ENTRY
C19F 08                 INX
C1A0 08                 INX
C1A1 08                 INX
C1A2 20 E9              BRA     FNDLI1      REPEAT
C1A4 E6 01      FNDLI2  LDA B   1,X         GET LSB OF NO. FROM TABLE
C1A6 F1 C2 C2           CMP B   TEMP1+1     IS IT THE ONE WE WANT
C1A9 26 F3              BNE     FNDL15
C1AB EE 02              LDX     2,X         GET NEW NO. FROM TABLE
C1AD FF C2 C1           STX     TEMP1       SAVE IT
                *
                *CONVERT BCD LINE NUMBER AT TEMP1 TO

                *ASCII AT ASTM1 THRU 4
                *
C1B0 B6 C2 C1   BCDCON  LDA A   TEMP1       GET MSB
C1B3 16                 TAB                 SAVE IT
C1B4 84 F0              AND A   #$F0        STRIP OFF MS NYBBLE
C1B6 26 08              BNE     BCDCH1      IS IT ZERO?
C1B8 86 FF              LDA A   #$FF        SET NOT USED FLAG
C1BA B1 C2 CB           CMP A   ASTM1       IS IT ALREADY SET?
C1BD 27 0A              BEQ     BCDCO1
C1BF 4F                 CLR A               SET TO ZERO, NOT FF
C1C0 44         BCDCH1  LSR A               SHIFT TO RIGHT NYBBLE
C1C1 44                 LSR A
C1C2 44                 LSR A
C1C3 44                 LSR A
C1C4 8B 30              ADD A   #$30        ADD ASCII BIAS
C1C6 B7 C2 CB           STA A   ASTM1       PUT IN ASCII TEMP
C1C9 17         BCDCO1  TBA                 GET MSB OF BCD LINE NO
C1CA 84 0F              AND A   #$F         STRIP OFF MS NYBBLE
C1CC 26 08              BNE     BCDCH2      IS IT ZERO
C1CE 86 FF              LDA A   #$FF        SET NOT USED FLAG
C1D0 B1 C2 CC           CMP A   ASTM2       IS IT ALREADY SET
C1D3 27 06              BEQ     BCDCO2
C1D5 4F                 CLR A               NO. SET IT TO ZERO
C1D6 8B 30      BCDCH2  ADD A   #$30        ADD ASCII BIAS
C1D8 B7 C2 CC           STA A   ASTM2       SAVE IT
C1DB B6 C2 C2   BCDCO2  LDA A   TEMP1+1     GET LSB OF BCD LINE NO.
C1DE 16                 TAB
C1DF 84 F0              AND A   #$F0
C1E1 26 08              BNE     BCDCH3
C1E3 86 FF              LDA A   #$FF
C1E5 B1 C2 CD           CMP A   ASTM3
C1E8 27 0A              BEQ     BCDCO3
C1EA 4F                 CLR A
C1EB 44         BCDCH3  LSR A
C1EC 44                 LSR A
C1ED 44                 LSR A
C1EE 44                 LSR A
C1EF 8B 30              ADD A   #$30
C1F1 B7 C2 CD           STA A   ASTM3
```

```
C1F4 17          BCDC03  TBA
C1F5 84 0F               AND A  #$F
C1F7 8B 30               ADD A  #$30
C1F9 B7 C2 CE            STA A  ASTM4
C1FC 39                  RTS
                 *
                 *LOOK FOR ASCII KEYWORDS THEN,GOTO, &GOSUB
                 *AND/OR END OF LINE
                 *
C1FD BD C2 BC    ON      JSR    SKIPSP     SKIP SPACES
C200 81 54       ON1     CMP A  #$54       IS CHAR A T
C202 27 0B               BEQ    THEN
C204 81 47       ON2     CMP A  #$47       IS CHAR A G
C206 27 28               BEQ    GOTO
C208 4D          ON3     TST A             END OF LINE?
C209 26 F2               BNE    ON
C20B 08                  INX               BUMP THE SOURCE POINTER
C20C 7E C0 63    ON4     JMP    RENU45     DO NEXT LINE
C20F 08          THEN    INX               BUMP THE SOURCE POINTER
C210 A6 00               LDA A  0,X        GET A CHARACTER
C212 81 48               CMP A  #$48       IS IT AN H
C214 26 EE               BNE    ON2
C216 08                  INX               BUMP THE SOURCE POINTER
C217 A6 00               LDA A  0,X        GET A CHARACTER
C219 81 45               CMP A  #$45       IS IT AN E
C21B 26 E7               BNE    ON2
C21D 08                  INX               BUMP THE SOURCE POINTER
C21E A6 00               LDA A  0,X        GET A CHARACTER
C220 81 4E               CMP A  #$4E       IS IT AN N
C222 26 E0               BNE    ON2
C224 BD C2 BC    THEN1   JSR    SKIPSP     GO SKIP SPACES
C227 BD C2 A7            JSR    TSTNO      GO TEST FOR NUMERIC
C22A 25 D8               BCS    ON2        BRANCH IF NOT
C22C 09                  DEX               DEC THE SOURCE POINTER
C22D 7E C0 AF            JMP    GO         GO RENUMBER IT
C230 08          GOTO    INX               BUMP THE SOURCE POINTER
C231 A6 00               LDA A  0,X        GET A CHARACTER
C233 81 4F               CMP A  #$4F       IS IT AN O
C235 26 D1               BNE    ON3
C237 08                  INX               BUMP THE SOURCE POINTER
C238 A6 00               LDA A  0,X        GET A CHARACTER
C23A 81 53               CMP A  #$53       IS IT AN S
C23C 27 0D               BEQ    GOSUB
C23E 81 54               CMP A  #$54       IS IT A T
C240 26 C6               BNE    ON3
C242 08                  INX               BUMP THE SOURCE POINTER
C243 A6 00               LDA A  0,X        GET A CHARACTER
C245 81 4F               CMP A  #$4F       IS IT AN O
C247 27 DB               BEQ    THEN1
C249 20 BD               BRA    ON3        ALL TESTS FAIL, REPEAT
C24B 08          GOSUB   INX               BUMP THE SOURCE POINTER
C24C A6 00               LDA A  0,X        GET A CHARACTER
C24E 81 55               CMP A  #$55       IS IT A U
C250 26 B6               BNE    ON3
C252 08                  INX               BUMP THE SOURCE POINTER
C253 A6 00               LDA A  0,X        GET A CHARACTER
C255 81 42               CMP A  #$42       IS IT A B
C257 27 CB               BEQ    THEN1
C259 20 AD               BRA    ON3        ALL TESTS FAIL, REPEAT
```

```
                  *
                  *TEST FOR OVERFLOW WHEN PUTTING NEW ASCII
                  *LINE NO IN SOURCE, OPEN A HOLE FOR IT
                  *IF NECESSARY
                  *
C25B 36           TSTOVF  PSH A           SAVE CHARACTER
C25C A6 00                LDA A  0,X      GET A CHARACTER FROM SOURCE
C25E BD C2 A7             JSR    TSTNO    GO TEST FOR NUMERIC
C261 24 1E                BCC    MOVRTS   IF IT IS, DONE
C263 FF C2 C7             STX    TEMP4    SAVE THE POINTER
C266 FE C2 C9             LDX    TEMP5    GET START OF LINE POINTER
C269 6C 04                INC    4,X      ADD 1 TO LINE BYTE COUNT
C26B DE 2A                LDX    NEXTBA   GET ADR OF FIRST BYTE AFTER SOURCE
C26D 08                   INX             BUMP IT
C26E DF 2A                STX    NEXTBA   SAVE IT
C270 FE C2 C5             LDX    TEMP3    GET ADR OF END OF TABLE
C273 08                   INX             BUMP IT
C274 FF C2 C5             STX    TEMP3    SAVE IT
C277 09           MOVE1   DEX             DECREMENT THE POINTER
C278 A6 00                LDA A  0,X      GET A CHARACTER
C27A A7 01                STA A  1,X      MOVE IT UP ONE BYTE
C27C BC C2 C7             CPX    TEMP4    DONE???
C27F 26 F6                BNE    MOVE1
C281 32           MOVRTS  PUL A           RESTORE A
C282 39                   RTS
                  *
                  *CLOSE HOLE MADE BY DELETEING LEADING ZEROS
                  *
C283 FF C2 C7     CLOSUP  STX    TEMP4    SAVE POINTER
C286 A6 01        CLOSU1  LDA A  1,X      GET A BYTE
C288 A7 00                STA A  0,X      MOVE IT DOWN ONE
C28A 08                   INX             BUMP THE POINTER
C28B BC C2 C5             CPX    TEMP3    DONE???
C28E 26 F6                BNE    CLOSU1
C290 FE C2 C5             LDX    TEMP3    GET END OF TABLE POINTER
C293 09                   DEX             SUBTRACT 1
C294 FF C2 C5             STX    TEMP3    SAVE THE NEW POINTER
C297 FE C2 C9             LDX    TEMP5    GET START OF LINE POINTER
C29A 6A 04                DEC    4,X      SUBTRACT ONE FROM LINE BYTE COUNT
C29C DE 2A                LDX    NEXTBA   GET POINTER TO FIRST BYTE AFTER SOURCE
C29E 09                   DEX             SUBTRACT ONE
C29F DF 2A                STX    NEXTBA   SAVE NEW POINTER
C2A1 4F                   CLR A           SET A TO
C2A2 4A                   DEC A           $FF
C2A3 FE C2 C7             LDX    TEMP4    GET POINTER
C2A6 39                   RTS             DONE
                  *
                  *TEST FOR NUMERIC CHARACTER
                  *
C2A7 36           TSTNO   PSH A
C2A8 81 30                CMP A  #'0
C2AA 2B 04                BMI    TSTNO1
C2AC 81 39                CMP A  #'9
C2AE 2F 03                BLE    TSTNO2
C2B0 0D           TSTNO1  SEC
C2B1 32                   PUL A
C2B2 39                   RTS
C2B3 0C           TSTNO2  CLC
C2B4 32                   PUL A
C2B5 39                   RTS
```

```
                *
                *SKIP SPACES
                *
C2B6 A6 00      SKIP1   LDA A  0,X
C2BB 81 20              CMP A  #$20
C2BA 26 03              BNE    SKIP2
C2BC 08         SKIPSP  INX
C2BD 20 F7              BRA    SKIP1
C2BF 4D         SKIP2   TST A
C2C0 39                 RTS
C2C1            TEMP1   RMB    2
C2C3            TEMP2   RMB    2
C2C5            TEMP3   RMB    2
C2C7            TEMP4   RMB    2
C2C9            TEMP5   RMB    2
C2CB            ASTM1   RMB    1
C2CC            ASTM2   RMB    1
C2CD            ASTM3   RMB    1
C2CE            ASTM4   RMB    1
                        END    RENUM

NO ERROR(S) DETECTED
```

TIME PROMPTS FOR FLEX®

R. Dembinski
12 Richard Rd.
Medway, MA 02053

I recently purchased the JPC Products CK-7 clock board for my SWTPc 6800 system. First, I am very pleased with JPC's response to my order, as UPS attempted delivery only 9 days after the day I mailed it. The product was as advertised and even included better than average documentation. The board was built and completely tested within a couple of hours. That time included keying in the source for the program that was supplied to test the clock board.

So, now that I had a clock on my system, what was I going to do with it? Well, since I run with Mini Flex, the first thing I decided to do was to extend the "+++" prompt to include the time of day, like some advanced systems. The result is the attached patch to Mini Flex. This patch develops a prompt of the form:

+++HHMM SS

which is then followed by a carriage return and line feed. The patch assumes the clock board to be on port 4 and that it has been properly initialized for use by the get digit routine. That initialization should include setting the clock to the current time of day. If RESET is used at any

time, the port must be reinitialized before the prompt will display a valid time. The following routine accomplishes this:

```
        CLR     PORT+1
        CLR     PORT+3
        LDA A   #$1C
        STA A   PORT+2
        LDA A   #4
        STA A   PORT+1
        STA A   PORT+3
```

The area used for this patch wasn't large enough to have this routine as part of it, so its function must be provided elsewhere.

Since this patch is always resident, assembly language and BASIC program could make use of it. Essentially, there are two useful routines called by:

```
    JSR   $7EA6        print time on console
    JSR   $7EB1        get and save current time
```

The stored time is kept in packed hex format.

With BASIC resident and setting location $0067 to $7EA6, the the statement Z9=USER(Ø) will cause the time to be typed out.

Modification of the pacth for use with Flex 1.0 or Flex 2.0 should be a matter of finding an unused area within them and changing a few service routine addresses. Also, the interrupt portion of the CK-7 board could probably be used to drive the print spooling feature of these systems. Maybe someone can look into this modification.

Good clocking.

```
+++1320 23
P,CAT 1
+++1320 57
(carriage return)
+++1321 05
```

Simulated example of prompts with time.

```
                NAM     SPATCH
        *
        * PATCHES TO MINI FLEX VER 1.0
        *
        * BY R. DEMBINSKI
        *
EOCA    PHEX    EQU     $EOCA       USE MIK/SWT BUG
```

```
EOC8                 PHX2      EQU     $EOC8
                     *
7118                 PSTRNG    EQU     $7118
711E                 PCRLF     EQU     $711E
                     *
8010                 PORTA     EQU     $8010
8011                 CRTIA     EQU     PORTA+1
8012                 PORTB     EQU     PORTA+2
8013                 CRTLB     EQU     PORTA+3
                     *
7EFC                 HOUR      EQU     $7EFC
7EFD                 MIN       EQU     HOUR+1
7EFE                 SEC       EQU     HOUR+2
                     *
                     *
                               ORG     $718E
718E BD 7E A3                  JSR     NEWPT     ALTER PROMPT WRITE
7EA3                           ORG     $7EA3     NEW CODE
7EA3 BD 71 18        NEWPT     JSR     PSTRNG    COMPLETE PROMPT
7EA6 8D 09                     BSR     TIME      GET TIME
7EA8 BD EO C8                  JSR     PHX2      EDIT TIME ALWAYS
7EAB BD EO CA                  JSR     PHEX      ON CONSOLE
7EAE 7E 71 1E                  JMP     PCRLF
7EB1 86 18           TIME      LDA A   #24       GET SEC
7EB3 CE 7E FC                  LDX     #HOUR     SET INDEX
7EB6 5F                        CLR B             MBZ ON INITIAL RUN
7EB7 8D 24                     BSR     GETD
7EB9 36                        PSH A             SAVE SEC
                     *
                     *
7EBA 86 1C                     LDA A   #$1C      TEN HOUR
7EBC 8D 1F                     BSR     GETD
7EBE 86 OC                     LDA A   #$OC      HOUR
7ECO 8D 1B                     BSR     GETD
7EC2 08                        INX               SET X FOR MIN
7EC3 86 14                     LDA A   #$14      TEN MIN
7EC5 8D 16                     BSR     GETD
7EC7 86 10                     LDA A   #$10      MIN
7EC9 8D 12                     BSR     GETD
7ECB 08                        INX               SET X FOR SEC
7ECC 86 08                     LDA A   #8        TEN SEC
7ECE 8D OD                     BSR     GETD
7EDO 86 18                     LDA A   #24       SEC
7ED2 8D 09                     BSR     GETD
7ED4 84 OF                     AND A   #$OF      GET SEC
7ED6 33                        PUL B             GET INITIAL SEC
7ED7 10                        SBA               SUB FROM A B
7ED8 25 D7                     BCS     TIME      REDO IF CARRY SET
7EDA 09                        DEX               LEAVE INDEX AT HOUR
7EDB 09                        DEX
7EDC 39                        RTS
                     *
7EDD 37              GETD      PSH B             PRESERVE B
7EDE F6 80 12                  LDA B   PORTB
7EE1 C4 E3                     AND B   #$E3
7EE3 1B                        ABA
7EE4 B7 80 12                  STA A   PORTB     SET FOR DESIRED DIGIT
7EE7 33                        PUL B
7EE8 B6 80 10                  LDA A   PORTA
7EEB 84 OF                     AND A   #$OF      GET LOW 4 BITS
```

```
*
7EED 58          ASL B           MOVE RIGHT 4
7EEE 58          ASL B           TO LEFT 4
7EEF 58          ASL B
7EF0 58          ASL B
7EF1 1B          ABA             GENERATE AND SAVE
7EF2 A7 00       STA A   0,X     HH, MM OR SS
7EF4 16          TAB             MOVE RESULT TO B
7EF5 39          RTS
                 END
```

A REVIEW OF SOME 6800 MONITORS

Robert C. Boyd
Woodlawn Ave., RFD 2
Kennebunkport, ME 04046

One of the most important features of Motorola 6800 systems is the use of read-only-memory (ROM) to provide a permanently stored monitor program. This feature enables the operator to enter commands through the control terminal immediately upon power-up without first keying-in a routine as on other systems.

Early M6800 systems utilized the MIKBUG[1] monitor and the 6820 Peripheral Interface Adapter (PIA) which connected the control terminal (usually a Teletype or video display device) to the microcomputer. Most user programs and commercial software were written to branch to MIKBUG subroutines to accomplish input or output operations; this reduced both the task of writing a program as well as the amount of memory required at execution time.

When Motorola announced the 6850 Asynchronous Communications Interface Adapter (ACIA), manufacturers and users quickly recognized its advantages over the PIA, particularly for interrupt-driven or high transfer-rate serial I/O operations. (The PIA was designed for 8-bit parallel I/O and not serial I/O. MIKBUG keeps the microcomputer in a timing loop while reading or writing data through the PIA, and, while in the loop, the microcomputer cannot be doing useful work. The maximum transfer rate possible with MIKBUG and the PIA is about 1200 bits per second(bps);

[1] registered trademark of Motorola Inc.

an ACIA is capable of rates in excess of 19,200 bps.) Many M6800 systems now provide an ACIA to connect terminals and other serial devices to the system.

The changeover from PIA to ACIA necessitates that the MIKBUG ROM be replaced with a monitor which will control the ACIA and be somewhat software compatible with MIKBUG in order to minimize changes to software which had used MIKBUG subroutines. Today the M6800 user is presented with a variety of ROM's and EPROM's containing monitors which may or may not be MIKBUG-compatible. Several monitors are designed to facilitate program development by including single-step, memory-dump, and register examine/change commands. There is at least one monitor available which will execute more than one task at a time. Some monitors contain commands to transfer control to user-written routines which would be stored elsewhere in EPROM or RAM, or to disk-based operating systems. The features of four MIKBUG-compatible monitors are presented in this article to assist the user in determining which monitor would be most useful in his M6800 system.

Table I lists the prominant commands and features of the SMARTBUG, SWTBUG[2], MSIBUG, and RT/68 monitors. The documentation supplied with each monitor contains details on hardware configuration and command usage as well as an assembly listing of the monitor. Each occupies 1024 bytes of area addressed starting at E000, and requires at least 128 bytes of RAM at A000 for work-area and stack. All four monitors contain commands to display registers, to examine and/or to change memory, to load or to punch tape, and to execute a user program. Each has the capability to jump to additional user-written commands which would be stored in EPROM or RAM. The SWTBUG has the feature of being able to direct IO operations to any port addressed from 8000 to 801C. The SWTBUG is available only in ROM; the other three monitors may be obtained in 2708 EPROM, and may therefore be easily customized by the user.

[2]registered trademark of Southwest Technical Products Corporation.

SWTBUG will communicate with the control terminal through either a PIA or ACIA at 8004; an optional PIA may be used at 8000 for tape load and punch commands. Furthermore, input and output operations may be vectored to other ports by first entering the port address into memory locations A00A-A00B. SWTBUG will then examine that port and configure itself for either a PIA or ACIA. These features facilitate using a video terminal at high transfer rate (or a Teletype at 110 bps) on the control port, a tape cassette system at 300 baud on port 0, and a line printer at yet another transfer rate on a third port. SWTBUG includes a command to home-up and clear the screen on the SWTP CT-1024 terminal, and another command to bootstrap the MF-68 minifloppy disk system. The byte-search command examines memory within the specified range and displays each address containing the specified data; this would be useful during certain phases of program development.

SMARTBUG requires an ACIA at 8008 to communicate with the control terminal. Commands are provided to examine and change the A or B accumulators, the condition code register, and the index register. The insert command enables the user to place a character into one or more memory locations; it would be used to clear memory to blanks or to any character (such as 3F - software interrupt) prior to loading and executing a program. The echo, no-echo, and hard-copy commands allow flexible control over those systems which contain more than one output device where output may be desired on one device but not on both at the same time. The trace command puts the microcomputer into single-step mode where one instruction is executed, the registers are displayed, and opportunity is granted to change the A, B, C, or X registers before continuing. Two commands are included to control the BFD-68 floppy disk system. Another command transfers control to E400 where additional EPROM or RAM may be located to contain the user's favorite programs or subroutines.

MSIBUG will communicate with the control terminal through an ACIA at 8000.

A tape cassette interface may be connected to either port 0 or port 1. As with SWTBUG, this facilitates tape operation at a different transfer rate from that of the control terminal. The lister or print memory command displays a block of memory in instruction format, i. e., one, two, or three byte instructions are displayed one instruction per line. The calculate checksum command will generate a three-byte checksum on the specified area of memory so that a user can easily determine if memory content has been altered by program execution. The commands to permit and inhibit print-out enable a section of a listing to be skipped entirely; another command will cause execution of a user-program to halt.

RT/68 requires either an ACIA at 8000 or a PIA at 8004 to connect the control terminal to the system. The PIA is always required to enable RT/68 to determine interface options, and it may be used to implement a real-time clock or a front panel abort switch. The RT/68 operates in console mode (to load, save, or debug programs), single-task mode (to execute MIKBUG-type software), or multi-task mode (where up to 16 tasks may execute concurrently). A task is defined as "a complete unit of object code that can compete for system resources independently." A comprehensive 80-page manual is included with the RT/68, and considerable detail is provided on multitasking, interrupt processing, and reentrant code.

This article has discussed the features of SWTBUG, SMARTBUG, MSIBUG, and RT/68, four MIKBUG-compatible monitors for the Motorola 6800 systems. Each monitor has a number of unique time-saving commands which will greatly increase the usefulness of a system which is currently using the MIKBUG monitor. The user who hopes someday to expand his system to include an EPROM board or a minifloppy controller can install one of these monitors today knowing that it has the features built in to facilitate that future expansion. Once it is installed, you'll wonder how you ever got along without it!

TABLE I

	SWTBUG	SMARTBUG	MSIBUG	RT/68
Manufacturer	Southwest Technical Products Corp.	Smoke Signal Broadcasting	Midwest Scientific Instruments, Inc.	Microware Systems Corp
Media	ROM	EPROM	EPROM	ROM or EPROM
Required interface	ACIA and/or PIA	ACIA	ACIA	PIA, optional ACIA
Task capability	single	single	single	up to 16 tasks
Commands and features:				
display registers	R	R	R	R
load memory from tape	O L	L	L n (1)	L
execute program	J aaaa	J aaaa	G aaaa	E, aaaa (2)
save memory onto tape	O P (3,4)	P aaaa bbbb (4)	P n aaaa bbbb	P, aaaa, bbbb (4)
write end of file on tape	O E (5)	---------------	part of P command	---------------
memory examine/change	M aaaa	M aaaa	M aaaa	M, aaaa
set breakpoint	B aaaa	K aaaa	---------------	B, aaaa
go to program/return from interrupt	G (5)	G (5)	---------------	G
jump to user routine	Z (at C000)	4 (at E4000)	X (at E400C)	ESC (at 7000)
print memory contents	---------------	---------------	T aaaa bbbb	D, aaaa, bbbb
home and clear CRT	C	---------------	---------------	---------------
disk bootstrap	D	Q	---------------	---------------
byte search	F bbbbaaaacc	---------------	---------------	---------------
examine/change registers	---------------	A,B,C, or X	---------------	---------------
insert into memory	---------------	I aaaa bbbb cc	---------------	---------------
program trace	---------------	T aaaa	---------------	---------------
calculate checksum	---------------	---------------	C aaaa bbbb	---------------
start/stop output routine	---------------	---------------	control S	---------------
terminate output routine	---------------	---------------	control E	---------------
activate multi-task mode	---------------	---------------	---------------	S
abort current function	---------------	---------------	control D	optional switch (6)
real-time clock	---------------	---------------	---------------	optional
vectored SWI and I/O	yes	---------------	---------------	---------------
Price	$19.95	$39.95 to $49.95	$60.00	$55.00

aaaa = beginning memory address
bbbb = endirg memory address
cc = data

O = optional port
n = I/O port number
X = user defined commands

1 optional echo on control terminal
2 single-task mode
3 beginning address previously entered into A002-A005
4 does not write end of file marker
5 start address previously entered into A048-A049
6 execution may be resumed

The following pictures were taken during our coverage of the Fourth West Coast Computer Faire - San Francisco, California - May 11, 12, 13th 1979. The 6800 crowd was outnumbered by the 'Appliance Crowd' and many 6800 vendors suggested this may be their last. The crowds were estimated at between 5000-7500 for all three days. See you next in Atlanta the 15th - 16th & 17th of June. 68 Micro Journal will be there also. Look for us at our booth #3, just to the right as you come in. See you then.......Don.

The SWTPC 'Gang' Dan Meyer behind the 'Kung-Fu' Moustache flanked by (r) Joe, (l) Gary and Dennis and Ron (software) on the other end.

TSC's Dave Shirk, explaining his software 'goodies' to an attentive faire-goer.

Mr. GIMIX himself - Richard Don with a full GHOST display.

Motorola's Terry Ritter (6809 pappa) and Noland Lewis (r) at the 'Big Fist' booth.

Advanced Computer Product's president, early 6800 device supplier (still is), David Freeman.

Dave Freeman (l) and Dr. Adam Osborne (r) getting it all together.

MicroDaSys's John Stuppy (r) with Charles Hotchkiss (l) who just bought a 6802 CPU board for his S100 machine.

MSI's VP and General Manager Dennis Seager demonstrating the new 'Business' package to a faire-goer.

The SWTPC Winchester Disk, should be available in the next couple months for about four biggies.

John Craig - Editor (and good friend) of Creative Computing. Note: Editor's Remarks this issue.

MAGIC SQUARES

Paul Pennington
CSRA Computer Club
Martinez, GA 30907

A magic square is an array of numbers arranged so that the sum of each row and column, as well as the two diagonals, is the same. An example is shown for order 5. A method of generating a magic square whose order is an odd number is to start with 1 on the middle square of the top row, then proceed numbering up and to the left diagonally (when you run off the edge "wrap around" to the other side) until a filled square is reached. Then drop down one square from the most-recently-filled square and continue. Incidentally, this algorithm was not developed by a computer programmer. It was brought from Siam to France by S. de La Loubere in 1687. (Reference: Knuth, The Art of Computer Programming, Vol 1, p 158)

```
0010 REM MAGIC SQUARES
0020 REM SEE KNUTH, VOL 1, PG 158
0030 PRINT "MAGIC SQUARE GENERATOR"
0040 INPUT "ORDER", D
0050 IF D/2=INT(D/2) THEN PRINT "ODD ORDER ONLY": GOTO 40
0060 DIM M(D,D)
0070 R=1
0080 C=INT(D/2)+1
0090 N=N+1
0100 M(R,C)=N
0105 IF N=D*D THEN 1000
0110 R=R-1
0120 IF R=0 THEN R=R+D
0130 C=C-1
0140 IF C=0 THEN C=C+D
0150 IF M(R,C)=0 THEN 90
0160 R=R+2: IF R>D THEN R=R-D
0170 C=C+1: IF C>D THEN C=C-D
0180 M(R,C)=N
0190 GOTO 90
1000 FOR R=1 TO D
1010 FOR C=1 TO D
1020 PRINT TAB(3*C); M(R,C);
1030 NEXT C
1040 PRINT
1050 NEXT R
9999 END
```

Sample RUN:

```
MAGIC SQUARE GENERATOR
ORDER? 5
  15  8  1 24 17
  16 14  7  5 23
  22 20 13  6  4
   3 21 19 12 10
   9  2 25 18 11
```

Extracted with THANKS from: CSRA Computer Club Newsletter
Paul Pennington - Editor
Martinez, GA 30907

EDITORS REMARKS

The subject of this column, this month, does not apply to our normal theme of '6800/09 information only'. As you read on you will understand why. Bear in mind that this has not happened to us in the 6800 crowd, but it does not mean it cannot, unless we all keep our guard up.

This is a true but sad tale of what can happen if a magazine does not check out it's advertisers. The losers are not only the rooked buyers but also us as the advertising media and of course the other good guys who honor their advertised promises.

Since we started we have turned down three advertisers. This means thousands in advertising revenue over a period of time. All for the same reason; I felt that their past track record was indicative of shoddy products and service, or promises unkept. The other magazines carry their advertising and we could sure use the advertising revenue. However, from the outset it was my firm intention to insure that we would attempt to protect our readers from unscrupulous advertisers. To this end I pledge my continued vigilance.

All of the advertisers in 68 Micro Journal are known to me personally, either by product use or report of others considered fair in their apprasial. This means that to the best of my knowledge and investigation ALL THOSE ADVERTISERS IN 68 MICRO JOURNAL are dependable and honest. We are very fortunate that the average 6800/09 vendor and manufacturer is as dedicated to your satisfaction as any sales group in the computer field.

I use this space to tell you the following because it seems that we need to be aware, you and I together. Also I want to commend John Craig, Editor of Creative Computing and Bill Godbout for their desire to keep the trade clean. Their actions have saved a lot of unsupecting micro buyers additional financial loss. That they are competitors or S100 vendors makes not a quid of difference in this instance; what counts is that we are all members of the human race and as such should have concern for one another.

It seems that a year or so back a company (?) by the name of DataSync started advertising heavily in most of the other computer magazines. It appears that the advertising was accepted by these magazines without much background knowledge of the product or principals involved. DataSync was headed up by a person known as Col. Dave Winthrop. It was discovered later (too late) that Col. Dave Winthrop had also other names. It was also belatedly discovered that Winthrop had headed other shoddy or dishonest operations. Needless to say; by the time his dishonest operation was uncovered, many micro hobbyist had lost a bundle (estimated at over $100,000.00).

The ads were mockups of other company's products, with the names deleted or covered up and additional devices pasted to the product. The line included everything from video terminals to memory kits. Actually not one item existed. Due to the action of John Craig and others, Winthrop was exposed, arrested and sentenced to prison. While in a California minimum security facility (where he had convinced many officials that he was on the verge of a 'solar energy' breakthrough) he escape.

Act Two: A few months back a new and heavy advertising company called 'World Power Systems' began advertising in nearly all the computer magazines. Believe it or not; the April issues. Not just one or two pages but 4 or 5 full pages, each month, in each magazine. Apparently none of the magazines became suspicious of such a large volumn by a new and unknow concern. It is not surprising that by the time it was over they were many thousands of dollars lighter. World Power Systems was headed up by a man by the name of Jim Anderson. Yep, you guess it, Winthrop up to his old tricks again. Seems some folks never learn. Oh, incidentially Winthrop's real name is supposed to be Norman Henry Hunt, but of course he rarely uses it.

Old Winthrop or Hunt or whatever would probably still be gathering it in if it had not been for the action of Bill Godbout of Godbout Electronics and John Craig of Creative Computing. One of the boards displayed in a World Power Systems ad looked suspicious to Bill. Bill got in touch with John and they decided to investigate World Power Systems (a little

late for some, as WPS had collected in about a half million, more or less). John made a 'bluff' call to world power last month (April), stating that he was going to travel to their fine company for a get acquainted visit. This threw them into a panic and they fled, leaving most of the loot behind in their haste. By this time John had come to realize that Winthrop was the moving power of World Power Systems, but the bad guys had saddled up with part of the diggings (also a couple of lassies included) and departed in typical western style. Not on horseback but in a new motor van. End of Act Two......but not quite all.

All this has a moral; I guess. If so, it has to be something like this: DEAL WITH MERCHANTS WHO YOU KNOW TO BE HONEST (OUR ADVERTISERS FOR INSTANCE). None of us can police the whole industry, but all of us collectively can go a long way in insuring that what has happened to others, will not be our lot, as concerns the above.

The end is not yet. Hunt is still at large, whoopeeing it up at the expense of fellow computer hobbyist, also some red-faced (red-inked also) computer magazines. John and Bill did us all a service, to them we all say 'THANKS'. The whole story is due out in Creative Computing in July. By then maybe Hunt will be apprehended and some of the latest victims will have recouped part of their losses; I sure hope so.

So in ending I will repeat a promise I made to you the first time out. 68 Micro Journal will continue to accept advertising only from those who WE KNOW TO BE HONEST. You can trust our advertisers. If in doubt call me. If you desire information on companies not advertising in 68 Micro Journal, call me. I have a pretty good file on most 6800 vendors, and some that are not. Together we can all enjoy this; the greatest hobby in the world...computing.

DMW

BASIC CASSETTE FORMATS

Phil Schuman
Reprint from '6800 Bits'
Chicago Area 6800 Newsletter

For those that have saved programs on cassette, and need to know if they can use those tapes on other BASIC's. the answer is a very simple ....maybe. It seems that each version is a little different from the next, but for the most part, they all follow a standard set when the 1st SWTPC BASIC came out. As you know, the data on the cassette is nothing more than a listing of the program. This is true, but there are a few more 'control characters' on the tape to help out.

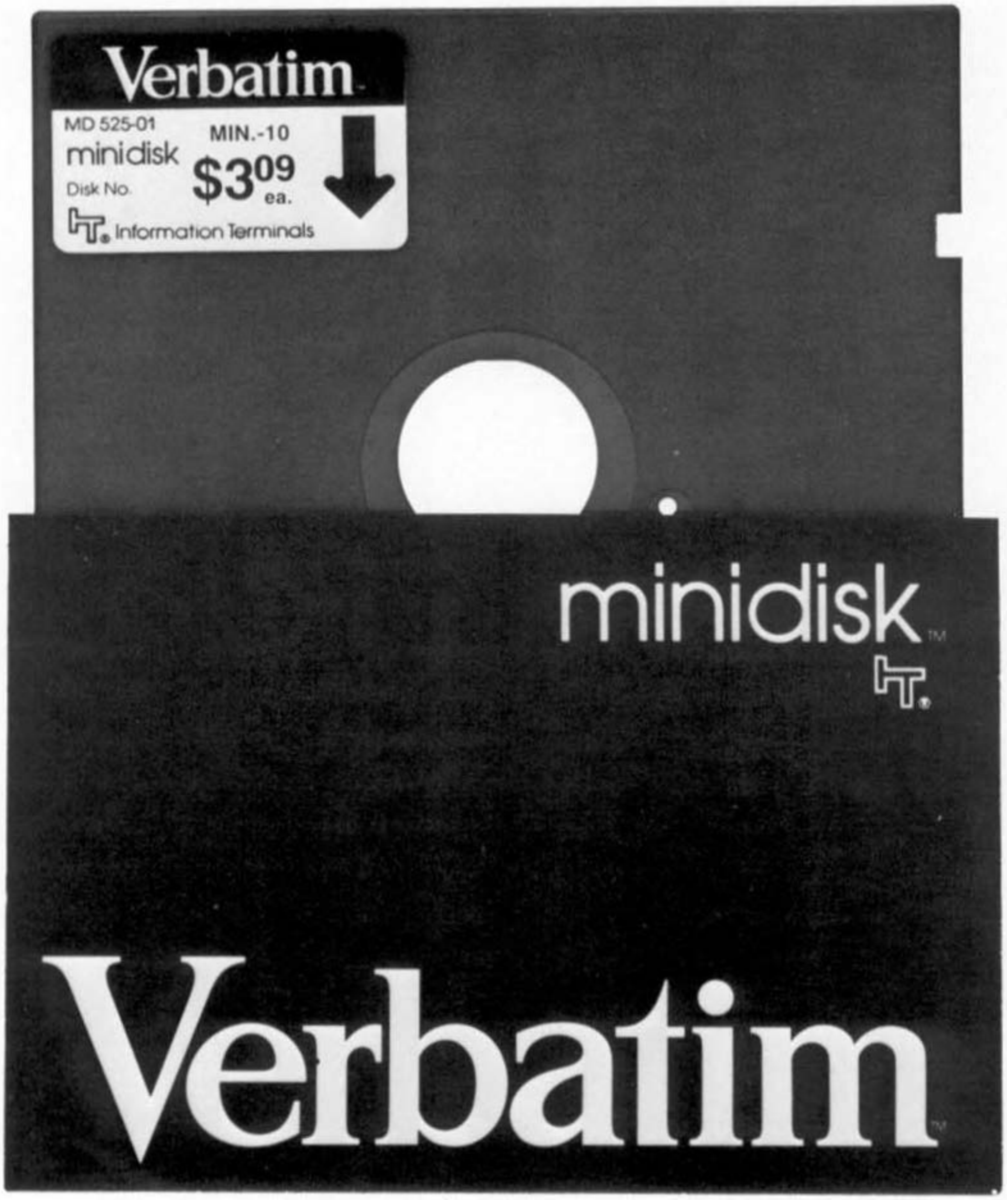
```
NULL Null or nothing    '00' or '7F'
     used to fill space or time.
STX  Start-of-text    '02'
     used to signal that valid data will
     follow this character.
ETX  End-of-text    '03'
     end of valid data for this block.
CR   Carriage-return    '0D'
LF   Line-feed    '0A'
```

The format of the tape is;

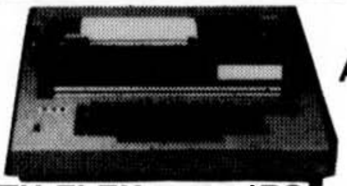
```
-EOT-  signal 1 character name follows.
  X    1 character user supplied name.
-STX-  indicate start of real data line.
  X    4 digit line number
  X    text portion of line
-CR-   carriage-return/line terminator
-LF-   line feed
-NULL- time delay - the number of nulls
       varies from version to version.
       this 'time delay' is used by the
       interpreter to 'digest' the line
       and convert it into it's internal
       format.
-STX-   ...... next line
  ........
-CR-
-LF-
-ETX-  indicates end of this BASIC program.
```

Some of the versions have a set of nulls at the beginning, and the end. The early versions of SWTPC used '7F' for the null, which meant you could 'see' them on the AC-30 LED's. The SWTPC versions use 4 nulls as the time delay, while the Computerware version uses only 2. Another interesting point is the LET verb. The SWTPC versions just output it if it is in the source.... LET A=1.
But, if it is not there, a '08' is put on the tape to indicate the implied LET. Computerware BASIC always outputs a LET, even if it is not in the source.....
10 A=1 is written 10 LET A=1.

Reprint from '6800 BITS'
Chicago Area 6800 Newsletter
Phil Schuman, Editor


Verbatim
MD 525-01
minidisk
Disk No.
MIN.-10
$3.09 ea.
Information Terminals
minidisk
Verbatim

SURPLUS ELECTRONICS

ASCII  ASCII

WITH FLEX DRIVERS ®
IBM SELECTRIC
BASED I/O TERMINAL
WITH ASCII CONVERSION
INSTALLED $645.00

- Tape Drives • Cable
- Cassette Drives • Wire
- Power Supplies 12V15A, 12V25A, 5V35A Others, • Displays
- Cabinets • XFMRS • Heat Sinks • Printers • Components

Many other items
Write for free catalog
WORLDWIDE ELECT. INC.
130 Northeastern Blvd.
Nashua, NH 03060
Phone orders accepted using VISA or MC. Toll Free 1-800-258-1036
In N.H. **603-889-7661**

DISK MIXER

SMOKE SIGNAL DISK USERS
RUN MIXED 8 AND
5 INCH DRIVES

The DM-85 Disk Mixer is an add-on board for the Smoke Signal Broadcasting BFD-68A Disk Controller which allows operation of both 8" and 5" drives. Controller mode (8" or 5") is selected on a drive-by-drive basis, so any mix of 5" and 8" drives is allowable. The 2" x 3" PC board mounts inconspicuously on the back of the BFD-86A. Its operation is completely transparent to software. An oscilloscope is required for the setup procedure. Kit Price: $39.95.

THE MICRO WORKS

Master Charge and BankAmericard

P.O. BOX 1110, DEL MAR, CA 92014 (714) 756-2687

FINALLY, A TELEPHONE WITH BYTE!

6800 AUTOMATIC TELEPHONE DIALER PROGRAM .... $9.95 postpaid
Have your 6800 system dial your phone • Uses only 5 external components • Stores 650 variable length phone numbers • Operates in less than 1K bytes of memory

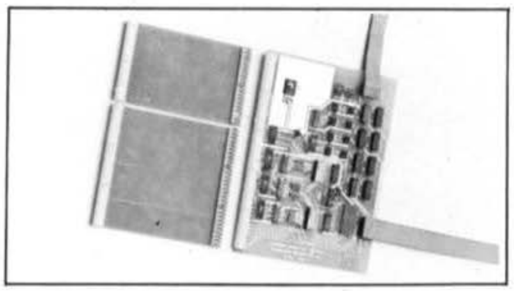
Includes: Paper tape in Mikbug* format and object code • Circuit diagram and instructions • Instructions for adapting to other 6800 systems

6800 TELEPHONE ANSWERING DEVICE PROGRAM .... $4.95 postpaid
Have your 6800 system answer your phone and record messages automatically. Compatible with any 6800 system.

Includes: Assembly listing and object code • Circuit diagram and instructions

Write to: **SOFTWARE EXCHANGE**
2681 PETERBORO
W. BLOOMFIELD, MICH. 48033

Mikbug® is a registered trademark of Motorola Inc.



6800 OWNERS

At last a real world **fully addressable** SS-50 control interface. Control robots, appliances, organs, solar devices, etc. Applications limited only by your imagination. Easy to use with machine language as well as basic. Fully buffered board plugs directly onto mother board and responds to any address defined by user. 8 fast relays latch data while 8 opto-isolators allow handshaking capacity.

Kit $98.00
Assembled and tested $125.00

EXTENDER BOARDS

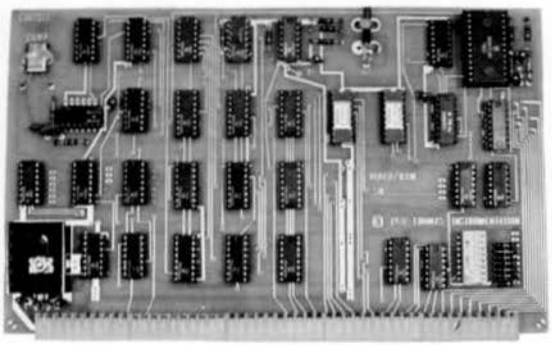
Extend both the 30 and 50 pin buses in SWTP 6800.
Both for $19.95.

Visa & Master Charge • Ariz. Res. add 5% Sales Tax

WRITE FOR DETAILS

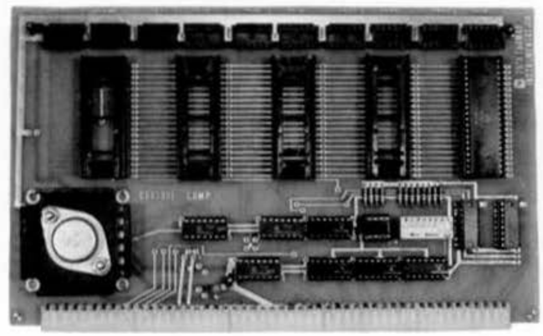
TRANSITION ENTERPRISES INC.
Star Route, Box 241, Buckeye, AZ 85326

GOOD DEAL EXTENDED!
PRICES SHOWN ARE FOR ORDERS RECEIVED BY JUNE 30
NORMAL PRICES APPROX. 10% HIGHER . . . CALL FOR DEALER, OEM, AND GROUP PRICING



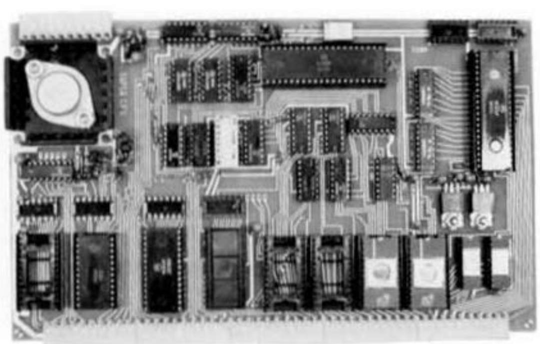
SS-50 VIDEO RAM
- Fully Synchronous Operation to Eliminate Jitter
- Full 128 Set of 7 by 9 Characters & Reverse Image
- 1K of Memory can be Mapped in any 1K Increment
- 10 Pages of Documentation Including Software

ASSEMBLED $135.00
CARD, CRYSTAL, & DOC $35.00



SS-50 PARALLEL I/O
- 2 Ports Expandable to 10 (Just Add PIA'S @ $6.95 ea.)
- Each Port has 8 I/O Plus 2 Control . . . 100 I/O Lines . . .
- Large Regulator Supplies Power to I/O Connectors
- Board Can be Mapped to any 32 Word Boundary

ASSEMBLED (W/1PIA) $89.00
CARD ONLY $32.00



SS-50 SUPER CPU
- SS-50 Buss . . or . . Stand Alone Computer
- 1K of Ram at $A000, I/O on Board at $A400 (Relocatable)
- 2K Monitor in 2708 Eprom (Expandable to 4K)
- 2 Parallel 8 bit ports with 2 Control Bits and Power
- 1 RS-232 ACIA Port (Expandable to 2nd TTL ACIA)
- 3-16 Bit Counter Timers (Expandable to 6 . . . Add 2nd 6840)
- Additional 128 Byte Ram at 0000 can be Jumpered out
- Battery Back-up Available on 32 Bytes of Ram
- Back/Back with other SS-50 Cards to Make Small Systems

ASSEMBLED (AS SHOWN) $179.00
CARD ONLY $44.00

Gimix 16K Without Soft Addressing $298.13
Gimix 16K Static Ram W/Softadd $368.16
Our SS-50 Wire-Rap Card $24.00

3, 4, and 7 slot SS-50 Backplanes
We also Make Non SS-50 Single Board 6800 Sys.

We have been in business for over 8 years, designing industrial machine tool controls and monitors . . . Call us for help with your product or laboratory instrumentation problem . . . we are dealers for:

GIMIX SWTPC SSB

*** * * LET US QUOTE YOU A PACKAGE PRICE * * ***

THOMAS INSTRUMENTATION

2709 Dune Drive, Avalon, N.J. 08202
Phone (609) 967-4280

VISA

We're not just blowing smoke

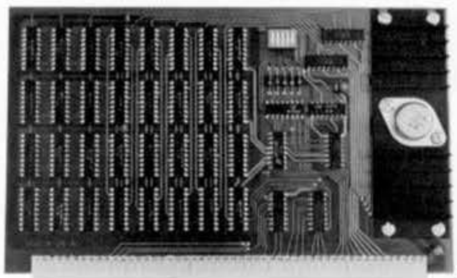
SMOKE SIGNAL BROADCASTING PRESENTS IT'S

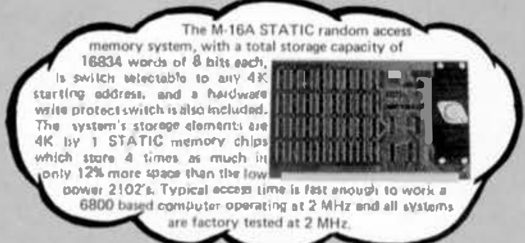
$299.00

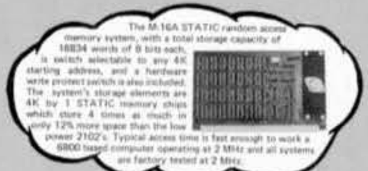
M-16A STATIC MEMORY SYSTEM

• Allows SWTPC 6800 expansion to 48K
• Low Power • Uses Single +8 Volt Supply
• SWTPC 6800 Plug Compatible • STATIC – No refresh required

The M-16A STATIC random access memory system, with a total storage capacity of 16834 words of 8 bits each, is switch selectable to any 4K starting address, and a hardware write protect switch is also included. The system's storage elements are 4K by 1 STATIC memory chips which store 4 times as much in only 12% more space than the low power 2102's. Typical access time is fast enough to work a 6800 based computer operating at 2 MHz and all systems are factory tested at 2 MHz.







SMOKE SIGNAL BROADCASTING®

31336 Via Colinas, Westlake Village, CA 91361, (213) 889-9340

SMOKE SIGNAL BROADCASTING®

31336 Via Colinas, Westlake Village, CA 91361
(213) 889-9340

☐ Send information on your M-16A
☐ Send name of nearest dealer

Name ____________________
Address ____________________
Company ____________________
City ____________________
State/Zip ____________________

'68' Micro Journal
3018 Hamill Rd.
Hixson, TN 37343

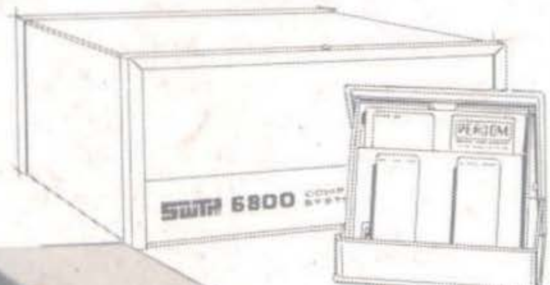
Second Class Postage
Paid at Chattanooga TN

000422 A/E
MR. MICKEY FERGUSON
BOX 708
TRENTON GA 30752

For your SWTP 6800 Computer . . .

PERCOM's™ FLOPPY DISK SYSTEM the LFD-400

Ready to plug in and run the moment you receive it. Nothing else to buy, no extra memory. No "booting" with PerCom MINIDOS-PLUSX™, the remarkable disk operating system on EPROM. Expandable to either two or three drives. Outstanding operating, utility and application programs.



To order or request literature call Percom toll-free 1-800-527-1592.

only $599^{95}

fully assembled and tested shipping paid

PERCOM™

PERCOM DATA COMPANY, INC.
211 N. Kirby Garland, TX 75042
(214) 272-3421

For the low $599.95 price, you not only get the disk drive, drive power supply, SS-50 bus controller/interface card, and MINIDOS-PLUSX™, you also receive:
• an attractive metal enclosure • a fully assembled and tested interconnecting cable • a 70-page instruction manual that includes operating instructions, schematics, service procedures and a complete listing of MINIDOS™ • technical memo updates — helpful hints which supplement the manual instructions • a 90-day limited warranty.

SOFTWARE FOR THE LFD-400 SYSTEM

Disk operating and file management systems

INDEX™ The most advanced disk operating and file management system available for the 6800. INterrupt Driven EXecutive operating system features file-and-device-independent, queue-buffered character stream I/O, Linked-file disk architecture, with automatic file creation and allocation for ASCII and binary files, supports sequential and semi-random access disk files. Multi-level file name directory includes name, extension, version, protection and date. Requires 8K RAM at $A000. Diskette includes numerous utilities $99.95

BASIC Interpreters and Compilers

SUPER BASIC A 10K extended disk BASIC interpreter for the 6800. Faster than SWTP BASIC. Handles data files. Programs may be prepared using a text editor described below $49.95
BASIC BANDAID™ Turn SWTP 8K BASIC into a random access data file disk BASIC. Includes many speed improvements, and program disk CHAINing $17.95
STRUBAL+™ A STRUctured BAsic Language compiler for the professional programmer. 14-digit floating point, strings, scientific functions, 2-dimensional arrays. Requires 20K RAM and Linkage Editor (see below). Use of the following text editors to prepare programs. Complete with RUN-TIME and FLOATING POINT packages $249.95

Text Editors and Processors

EDIT68 Hemenway Associates' powerful disk-based text editor. May be used to create programs and data files. Supports MACROS which perform complex, repetitive editing functions. Permits text files larger than available RAM to be created and edited $39.95

TOUCHUP™ Modifies TSC's Text Editor and Text Processor for PerCom disk operation. ROLL function permits text files larger than available RAM to be created and edited. Supplied on diskette complete with source listing $17.95

Assemblers

PerCom 6800 SYMBOLIC ASSEMBLER Specify assembly options at time of assembly with this symbolic assembler. Source listing on diskette $29.95
MACRO-RELOCATING ASSEMBLER Hemenway Associates' assembler for the programming professional. Generates relocatable linking object code. Supports MACROS. Permits conditional assembly $79.95
LINKAGE EDITOR – for STRUBAL+™ and the MACRO-Relocating assembler $49.95
CROSS REFERENCE Utility program that produces a cross-reference listing of an input source listing file $29.95

Business Applications

GENERAL LEDGER SYSTEM Accommodates up to 250 accounts. Financial information immediately available — no sorting required. Audit trail information permits tracking from GL record data back to source document. User defines account numbers $199.95
FULL FUNCTION MAILING LIST 700 addresses per diskette. Powerful search, sort, create and update capability $99.95
PERCOM FINDER™ General purpose information retrieval system and data base manager $99.95

™ trademark of PERCOM Data Company, Inc.
™ trademark of Hemenway Associates Company

Now! The LFD-800 and LFD-1000. Add one, two or three LFD-800 drives and store 200K bytes per drive on-line. Add one or two (dual-drive) LFD-1000 units and store 800K bytes per unit on-line. Complete with interface/controller. DOS, cable & manuals. **Two-drive** systems: LFD-800 — $1549; LFD-1000 — $2495.

PERCOM *'peripherals for personal computing'*